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The Growth Response of Toman Fish (*Channa micropeltes* Cuvier.) with Different Satisfaction Times

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Abstract: The high price of Toman fish (*Channa micropeltes* Cuvier.) in the market is one of the reasons for the needfor Toman fish farming activities. However, the high price of commercial feed causes the high cost of cultivation. Effective and efficient feeding can reduce feed costs. Fasting can be a method for increasing the appetite of Toman Fish so that it will be increasing the efficiency of feed. This study aims to determine the effect of fasting time on thegrowth of Toman fish. The research method used an experimental trial with a Complete Randomised Design. Treatment factors were different fasting times, P1 (No fasting/control), P2 (1-day fasting and 4 days fed), P3 (1-day fasting and 3 days fed), P4 (1-day fasting and 2 days fed), and P5 (1 day fasting and 1 day fed). The parameters observed were weight growth, length growth, survival rate (SR), and feed efficiency. The treatment of 1 day of fasting and 1 day fed for Toman fish rearing was the best treatment for length growth (3.35 cm), weight (11.06 grams),survival rate (89%), and feed efficiency (70%).
Keywords: fasting, growth, toman fish

1. Introduction

Toman fish (*Channa micropeltes*Cuvier.) is one type of carnivorous fish from the family Channidae, the largest fish of the genus Channa. The toman fish is a carnivorousfish that feeds on Mollusca, crustaceae, plankton (phytoplankton and zooplankton) around its environment. [1] Toman fish live and develop in Indonesian waters which are also spread in parts of South Sumatra [2]. Toman fish has good potential to be developed as a cultivation business, because the selling price is quite high in the market and very promising with prices reaching Rp 50,000 per/kg [3]. Toman fish is one of the freshwaterfish that is widely cultivated in rivers. The cultivated toman fish is the catch of fishermenin small sizes, then nurtured in cages until the size of consumption and ready to be marketed.

The cultivation of toman fish (*Channa micropeltes* Cuvier.) currently still faces many obstacles, namely high mortality rates at the larval and fry stages (50-70%) and slow growthrates [4] Another obstacle that is more complained about by toman fish farmers (*Channa micropeltes* Cuvier.) is the high priceof commercial feed [5]. Feed is one of the sources of energy in growth and affects the production cost component, which amounts toabout 80% of the total production cost. The high price of feed from time to time results in increased production costs, so it is necessary to seek the use of alternative feed for fish farming. Another alternative feed is in the form of plankton (phytoplankton and zooplankton) in the waters can be utilized by fish by seeing thatthe selected feed must be maintainedavailability both in quality and quantity, whichis easy to obtain, economical and available all the time [6].

One alternative feed as a source of protein, vitamins, and minerals that are highenough and low in fat for the growth of tomanfish (*Channa micropeltes* Cuvier.) is the rice snail (*Pila ampullacea* Lamarck.). Besides being easy to obtain, the price is affordable bycultivators and also very easy to process.According to [7] rice snails with high proteincontent can be utilized as an alternative protein source. In addition to protein, it also contains many vitamins and minerals that are quite high.Inefficient feeding can increase production costs in fish farming in general, but effective feeding techniques can

reduce highfeed costs. To optimize the growth of the fishwe raise, it is necessary to limit feeding toincrease their productivity. One of thestrategies to reduce the high feed requirement is by overfeeding. Satisfaction is the process ofbreaking down nutrients in the fish body with alonger than usual gastric emptying time. Theprinciple of satisfaction is feeding with theminimum possible, but not inhibiting fishgrowth [8]. Meanwhile, according to [9], periodic gratification can increase the speed offish growth even higher when compared to fish that are not satisfied.

The method of grazing will affect the increase in the appetite of fish and this can affect the feed consumed. Periodic satiation can increase the growth rate of toman fish(*Channa micropellets* Cuvier.) which is equivalent or even higher when compared to toman fish (*Channa micropeltes* Cuvier.) that are not satisfied [9]. This is due to compensatory growth. Compensatory growth is a faster growth compared to normal feeding that occurs after the fish passes the feeding restriction period and is then fed back according to its needs. [10] stated that, the best periodic satisfaction of tilapia can be seen fromthe growth and survival of tilapia with feed efficiency of 1 (one) day of feeding and 3(three) days of feeding. [11] stated that periodic feeding of milkfish had a significant effect on length growth, daily growth rate, feed efficiency, and feed conversion ratio, but had no significant effect on weight growth. Compensatory growth was obtained in the treatment of 1 (one) fasting day and 4 (four) days fed. The best results for milkfish feed efficiency were also found in the treatment of 1 (one) day of fasting and 4 (four) days of feeding. The purpose of this study was to determine the effect of fasting time on thegrowth and survival of toman fish.

2. Material and Methods

2.1 Materials

The materials used in this study were Murrel fish with lengths 12-15 cm, 60 fish purchased from fish farmers or fishermen, pellets with type 781-2 purchased from the fishshop, and rice snails (Pila ampullacea Lamarck.) purchased from the market. While the equipment used was 12 aquariums and aerators and water quality measuring devices.

This research was conducted at the Fisheries wet laboratory, Faculty of Agriculture, the University of Muhammadiyah Palembang from September to November 2021.

2.2 Experimental variables and analytical procedures

This research was conducted using a completely randomized design (CRD) with 5 treatments and 4 replicates as follows:

P1: No fasting (control treatment) P2: 1 day fasting 4 days fed
P3: 1 day fasting 3 days fed P4: 1 day fasting 2 days fedP5: 1 fasting day 1 day fed

2.3 Methods

2.3.1 Data collection and preparation

Before the research was conducted, 20 aquariums were prepared, each equipped with an aerator. Next, the aquarium was filled with water and settled for two days, then spread the Murrel fish into the aquarium with 4 fish each/aquarium by acclimatizing first so that the seeds do not experience stress. The feed givenwas type 781-2 pellets and rice snails (*Pila ampullacea Lamarck*.). The shell of the snail was broken and then the chewy meat was taken, finely chopped, and given as additional feed for the growth of Murrel fish. Feeding onthe first day of stocking was carried out ad- libitum (until full) at 09.00 WIB, 16.00 WIB, and 20.00 WIB. The next day the fish fry beganto be fed according to their treatment. Sampling observations were made every 10 days using a simple random sampling technique or random sampling in each treatment as much as 50%. Furthermore, observing water quality includes temperature using a thermometer and pH measurement using a pH meter.

2.4 Data analysis

2.4.1 Data measured and analyzed included:

a. Weight growth is the difference between the weight of toman fish in the final observation with the weight of toman fish at thebeginning of the study. According to [12] weight growth using the growth formula as follows:

$$W = Wt - Wo$$

Description:
Wm = Absolute weight growth of toman fish reared (g)

Wt = Weight of toman fish at the end of maintenance (g)
Wo = Weight of toman fish at the beginning of maintenance (g)

b. Length growth is the difference between the length of the toman fish from the tip of the head to the tip of the tail of the fish body at the end of the study with the length of the toman fish body at the beginning of the study. Measurement of fish length using the length growth formula according to [12], namely:

$$P = Pt - Po$$

Description:
P = length growth of toman fish reared (cm)
Pt = length of toman fish at the end of maintenance (cm)
Po = length of toman fish at the beginning of maintenance (cm)

2.4.2 Survival (SR)

SR is the level of comparison of the number of fish that live from the beginning to the end of the study. According to [12], the survival rate can be calculated by the formula:

Description:

$$SR: \frac{Nt}{No} x100\%$$

SR = Survival (%)
Nt = Number of toman fish that live at the endof the experiment (tail)
No = Number of toman fish alive at the beginning of the experiment (fish)

The effect of treatment on the observation parameters was analyzed using analysis of variance (ANOVA). If the test results between treatments have a real or very real effect, further tests will be carried out with the Least Real Difference Test (BNT Test) witha confidence level of 95% [13]

2.4.3 Efficiency of Feed Utilisation

$$EPP = ((Wt+D)-Wo)/F \times 100\%$$

Description:
EPP : Feed utilisation efficiency (%)
Wt : Biomass weight of test fish at the endof the study (g)
Wo : Biomass weight of test fish at the beginning of the study (g)
F : The amount of feed consumed during the study (g)

3. Results and Discussion

Based on the results of research that has been conducted for 60 days (seven observations) on the growth of length and weight growth and SR of toman fish (*Channa micropeltes* Cuvier.) with the treatment of satisfaction and measurement of water quality which includes temperature and pH. Based on the results of the analysis of variance showed that satisfaction has a significant effect on the growth of the length of toman fish (*Channa micropeltes* Cuvier.) produced. BNT test results of measurements of length growth, weight, and survival of toman fish (*Channa micropeltes* Cuvier.) are shown in the table below.

Table 1. Results of LSD Test on the Effect of Fasting on Length Growth of MurrelFish (*Channa micropeltes* Cuvier.)

Treatment	Length (cm)	LSD $_{0,05}$ = 0,50
P1	2.59	a
P2	2.46	a
P3	2.41	a
P4	2.26	a
P5	3.35	b

Table 2. LSD Test Results of the Effect of Fasting on Weight Growth of Murrel Fish (*Channa micropeltes* Cuvier.)

Treatment	Weight (gram)	LSD $_{0.05}$ = 1.03
P1	6.21	b c
P2	5.11	a
P3	6.44	c
P4	5.31	a b
P5	11.06	d

Growth is the increase in the size of thefish body both in length and weight in a certainperiod and time, this is due to changes in tissuedue to cell division, muscle and bone as the largest part of the fish body [14] The results of the analysis of variance showed that satiation had a significant effect on the length and very significant effect on the body weight of toman fish (*Channa micropeltes* Cuvier.). Based on the results of the BNT test in Table 1 and Table2, the results showed

that the length and body weight of toman fish (*Channa micropeltes* Cuvier.) were highest in the P5 treatment (1 day fasting 1 day fed) with an average value of 3.35 cm and 11.06 g. Body length of toman fish (Channa micropeltes Cuvier.) treatment P4 (1 day fasting 2 days fed) with an average value of 2.26 cm and the lowest body weight of toman fish (*Channa micropeltes* Cuvier.) in treatment P2 (1 day fasting 4 days fed) with anaverage value of 5.11 g. The highest body length and weight of toman fish (*Channa micropeltes* Cuvier.) were found in treatment P2 (1 day fasting 4 days fed) with an average value of 5.11 g.

Treatment P5 (1 day fasting 1 day fed) produced the highest length and body weight of toman fish (*Channa micropeltes* Cuvier.) from other treatments. The treatment of 1-day fasting and 1 day fed is the optimal feeding method in the growth of toman fish (*Channa micropeltes* Cuvier.). During 1 day of fasting toman fish (*Channa micropeltes* Cuvier.) will naturally maintain energy (derived from the previous day's feed) in its body as a physiological response. Because the satisfaction of energy used for the movement of toman fish (*Channa micropeltes* Cuvier.) will be reduced and the energy will be utilizedfor the growth of the body of toman fish (*Channa micropeltes* Cuvier.). According to [8], the energy obtained from feed can be used to maintain the body, and fish movement and replace damaged cells, and can also be used foroptimal growth and development. The level offeeding to the needs of fish will provide optimal growth.

Highly nutritious fish feed serves toproduce energy used for fish growth and development. The quality of the nutritional content of the feed plays a greater role than thequantity of feed given. The maximum growth of length and weight of Murrel fish (*Channa micropeltes* Cuvier.) in the P_5 treatment, in addition, to feed efficiency and optimization of nutrients through the satisfying method, also requires feed that contains high protein nutrients such as rice snails. This is because rice snails contain macronutrients (protein) andmicronutrients (Mg, Ca, K and P) in high enough levels in their bodies. The protein in rice snails can be utilized as an alternativeprotein source in Murrel fish (*Channa micropeltes Cuvier.*) feed. Murrel fish (*Channa micropeltes* Cuvier.) has different nutritional needs based on its growth rate. Murrel fish in the form of seeds require proteinnutrition as much as 50% of the amount of feedconsumed. The protein content of rice snail meat 16.10 g/100g can meet the nutritional needs of protein optimally in Murrel fish seeds(*Channa micropeltes* Cuvier.) which can be seen in treatment P5 (1 day fasting 1 day fed) with the highest length and body weight of Murrel fish (*Channa micropeltes* Cuvier) from other treatment. In P1, fish are fed according tohabit, 2-3 times a day, not all feed can beutilized by the fish, some of which is not eatenand settles at the bottom of the rearing container and causing a decrease in water quality. Therefore, compare to the grazing treatment, the food will be more optimallyutilized by providing intervals or pauses, so that the fish have time to digest and utilize the feed given.

When the fish are fed again after satiation, it is expected that the fish's appetite will increase due to the absence of feed eaten in a certain time and feed will be optimally utilized for metabolism. Feeding arrangementsby way of satisfaction will be utilised to be optimal for growth and survival [15]. Furthermore [16], compensatory growth is faster growth compared to normal feeding that occurs after fish pass through a period of feeding restrictions and is then fed back according to their needs.

The treatment with the satisfaction method in the P2, P3, and P4 treatments was not the optimal satisfaction treatment and the P1 treatment without satisfaction/control resulted in a lower length and weight of toman fish (*Channa micropeltes* Cuvier.) compared tothe P5 treatment. The amount of feedconsumed will be utilized for energy needssuch as for movement and growth in the body of toman fish (*Channa micropeltes* Cuvier.). The non-optimal gratification period imposed on toman fish (*Channa micropeltes* Cuvier.) causes the energy obtained from the feed is not be optimally utilised, thus reducing the length and weight gain in the P2, P3, P4, and P1 treatments compared to the P5 treatment.

According to [17], the relatively small difference in growth between fish that are fed and fish that are not fed is thought to be because periodic feeding affects energy utilisation when fish do not receive feed intake. [18] The amount of feed given is very important because if it is too little, it will resultin slow fish growth and there will be competition for feed which results in variations in fish size and results, if the feed

consumed is too much, it causes environmental pollution which comes from the remaining unconsumed feed and fish waste from metabolism andinefficient feeding. [5] stated that the periodicsatiation of tilapia with the treatment of 1 daysatiated and 4 days fed had an effect on thegrowth of length and weight of tilapia. The highest growth in tilapia is thought to be relatedto the hyperphagia response during the periodof 1 day of starvation and re-feeding for 4 days. Satisfaction of catfish (*Pangasius* sp.) significantly affects the absolute weight, length, and FCR. The 12-hour grazingtreatment was the best treatment with thehighest length of growth. The higher lengthgrowth in the 12-hour grazing treatment is dueto the test fish consuming more feed which is asource of nutrients for growth [17]. [19], statesthat, grouper seeds 12 hours after being fed stilloccur the process of digestion in the stomach.Feed pellets have partially disintegrated into achime and some are still in the form of granules. In fish fry that are fasted for after 21 hours, the intestines begin to fill with thechyme and after 24 hours the stomach beginsto empty the food that becomes chyme has entered the intestines.

3.2 Survival rate

The survival rate is the percentage of the number of fish alive at a certain time compared to the number of fish at thebeginning of rearing. LSD test of survival of Murrel fish (*Channa micropeltes* Cuvier.) is shown in Table 3.

Table 3. LSD Test Results of the Effect of Fasting on the Survival of Murrel Fish (*Channa micropeltes* Cuvier.)

Treatment	SR (%)	LSD $_{0.05}$ = 4.25
P1	75.00	a
P2	78.57	a
P3	79.46	a b
P4	82.14	b
P5	89.29	c

There are three levels of survival rate (SR) of fish, namely: level I with a percentage ≥ 50% (classified as good), level II with apercentage of live 30-50% (classified asmoderate) and level III with a percentage < 30% (classified as not good). [5] states that thesurvival rate of fish is highly dependent on theadaptability of fish to food and also to theenvironment, then also the health status of fish,stocking density, and sufficient water quality so that it also support its growth The results ofthe analysis of variance in Table 3, show that satisfaction has a very significant effect on the survival of toman fish (Channa micropeltes Cuvier.). The highest survival rate of toman fish (Channa micropeltes Cuvier.) was found in treatment P5 (1 day fasting 1 day fed) with an average value of 89.29% and the lowest in treatment P1 (without satisfaction/control) with an average value of 75.00%.

Treatment P5 (1 day fasting 1 day fed)resulted in the highest survival of Murrel fish from other treatments. This treatment is the optimal feeding method for the survival ofMurrel fish. Because of fasting, the energyfrom feeding will be utilized optimally in the metabolism of Murrel fish. Fasting will also increase the appetite of Murrel fish so that the feed given will be very efficient. It could be seen from the low residual feed in the aquarium. It can reduce water pollution which is a metabolic waste. The forms of waste are fish feces and residual feed that has not been consumed by fish. If the water quality is maintained, so the survival of Murrel fish can be improved.

Fish mortality is thought to be a result of the fish not being accustomed to adapting toa new environment. Then the death of toman fish is also caused by the amount of feed that isnot eaten by the fish so that it settles at the bottom of the aquarium and eventually turns into ammonia. Ammonia (NH3) in waters comes from fish faeces and also the remains offeed that is not eaten by fish [15]. This ammonia is toxic and causes water quality pollution from the breakdown of protein in the water. This situation will affect the appetite ofthe fish so that the fish gradually become sick and eventually die. Excess protein and fat in thebody of fish can cause fat accumulation so thatthe appetite of fish decreases.

Furthermore, the mortality of tomanfish fry during the study is thought to be relatedto stress due to the sifting process, competition between species of both containers and feed, water quality, and cannibalism of the toman fish itself. Temperature affects fish survival. Temperature also affects the level of fish appetite and resistance to disease [15]. Mortality or death of fish is most dominantly influenced by competition between species, increasing predators and parasites, lack of food(quality and quantity), handling, and water quality. According to [20] prolonged starvationresults in energy for growth and mobility not being fulfilled it can result in the insufficient nutritional content of feed as a source of energy, and finally the fish experience death.

Fasting treatment in the P2, P3, and P4 treatments can be said to be non-optimal fasting treatment, as well as the P1 treatment (without Fasting/control) resulted in lower survival of Murrel fish (*Channa micropeltes* Cuvier.) compared to the P5 treatment. The amount of feed consumed exceeds the optimallimit causing water

pollution due to the remaining feed that is not consumed. The period of fasting that is not optimal for fish causes feed to be converted into energy, in the metabolic process is not utilized optimally by Murrel fish. The deposition of residual feed, feces, and the rest of the metabolic results can reduce water quality in the aquarium, so fish mortality will increase and the percentage of survival of Murrel fish will decrease. The P2, P3, P4, and P1 treatments gave worse results than the P5 treatment.

3.3 Efficient feed utilisation (EPP)

Feed utilization efficiency is a parameter to measure how much feed is consumed by Murrel fish and arrange the growth of fish.

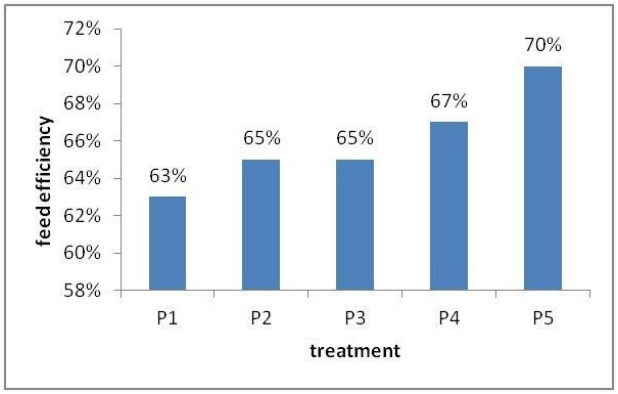

Figure 1: Feed efficiency in each treatment during rearing fish time

Measuring the efficiency of feed did not show a significant effect, but the results show that the P5 treatment (1 day of fasting; 1 day of eating) had the highest feed efficiency of 70%. Feed efficiency describes how much feed is used by fish for its growth. From the results of this study, the P5 treatment (1 day offasting and 1 day of eating) got the highest efficiency. Similar results were also shownfrom research by [5] and [21]. The highest feedefficiency was shown in the treatment of one day of fasting and one day of feeding.

3.4 Water Quality

An important factor that greatly affects the survival of toman fish (*Channa micropeltes* Cuvier.) is water quality. The quality of a bodyof water has a considerable influence on the survival and growth of living things in thewater. A good environment is necessary for animals for growth and survival [22]. Datafrom observations of water quality measured during the study include pH and temperature are still within the tolerance limits for the survival and growth of toman fish (*Channa micropeltes* Cuvier.). Toman fish (*Channa micropeltes* Cuvier.) will grow and breed well, provided that the water quality in the cultivation / domestication environment must be in accordance with the water quality of the living habitat of toman fish (Channa micropeltes Cuvier.) in nature.

Temperature is an important factor for life. Too high or too low temperature causes the fish body to experience metabolic disorders that can cause death. This means that for the growth and survival of toman fish (*Channa micropeltes* Cuvier.) requires an optimal temperature. The temperature during the study ranged from 27.2 - 29.0^{o}C, this range is still feasible and eligible for the maintenance of toman fish (*Channa micropeltes* Cuvier.) because toman fish (*Channa micropeltes* Cuvier.) can still grow healthily and not experience death. According to [23], the ideal temperature for tropical fish such as toman (*Channa micropeltes* Cuvier.) ranges from 25 – 32^{o}C. Meanwhile, accordingto [24], temperature in the water is one of the determining factors that can affect the appetite and growth of fish, fish metabolism, and affectthe amount of dissolved oxygen contained in water. The optimal temperature for tropical fish ranges from 28 – 30^{o}C.

The pH quality of the water during the study measured ranged from 7.1 - 7.5. The level of acidity or basicity of liquid substances(pH) in this range is good and very ideal for the growth of toman fish (*Channa micropeltes* Cuvier., because in this situation toman fish (*Channa micropeltes* Cuvier.) can grow well. The range of pH values is normal, if the pH range is too high or low will disrupt the growthof length, weight growth and survival of toman fish (*Channa micropeltes* Cuvier). ThepH value affects growth. water pH <4.5 causesstunted fish growth because the water iscategorizedd as toxic to fish. the best pH for growth is in the range of 6.5-9.0 [10].According to [25]. pH is one of the limitingfactors and has a very large influence on the growth and breeding of fish.

4. Conclusion

The best fasting treatment for the length, weight, survival l and feed efficiency of Murrel fish (*Channa micropeltes* Cuvier.) rearing is P5 (1 day fasting 1 day fed) with an average value of

3.35 cm, 11.06g, 89.29%, and70%, respectively.

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