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## EFFECT OF FEEDING FERMENTED *LEMNA* SP ON GROWTH IN FISH THAT HAVE DIFFERENT HABIT FOODS

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### KeyWords

Catfish, Tilapia, fermented Lemna sp. meal, Daily Growth Rate, Survival rate.

### ABSTRACT

This study aims to determine the percentage of addition of fermented *Lemna* sp meal artificial feed that can increase growth rates in two types of fish with different food habits (catfish and tilapia). The study was conducted at Ciparanje Laboratory and Hatchery in Building 4 of the Faculty of Fisheries and Marine Sciences, Padjadjaran University. This study used an experimental method with Completely Randomized Design (CRD), which consisted of four treatments and three replications, by giving feeds with the addition of *Lemna* sp meal with fermentation of 30%, 40%, 50%, and 60%. Parameters observed were growth rate, survival rate and water quality. Data on growth, feed conversion ratio and survival were analyzed using variance analysis and continued with Duncan's Multiple Range Test. The results show that the addition of *Lemna* sp. Fermented meal yields up to 30% of feed weight produce a higher daily growth rate in tilapia (1.40%), while in catfish is 1.12%. The survival rate of catfish in this experiment is 100%, while the survival rate of tilapia is 82.22%.

## INTRODUCTION

Feed plays an important role in aquaculture activities, because feed is the main source of nutrition and energy obtained for fish to grow. The range of costs of feed needed during cultivation can reach around 60-70% of the operational costs of cultivation. Therefore, alternative raw materials are needed as a solution to reduce feed costs. One effort that can be done to overcome this problem is by adding protein ingredients that can be obtained from plants or foliage to artificial feed.

One of the aquatic plants that can be used as a source of protein is *Lemna* sp. This plant is a type of small aquatic plant that is found floating and growing on water and potentially as a source of high-quality feed's ingredient. *Lemna* sp. has the potential as an alternative feed, which is rich in protein and minerals. Crude protein content from *Lemna* sp. is as high as 37.6% (Nopriani et al 2014). The disadvantage of forage feed is the high crude fiber content. The fiber content contained in *Lemna* sp. is 23.06% (Handajani 2007). The high percentage of fiber is difficult for fish to digest (Sutriana 2007). One of the efforts to overcome the high fiber content is fermentation technology. According to Abun (2010) the fermentation process can cause improvements in the properties of raw materials. Besides being able to increase digestibility, fermentation process can also improve the taste and aroma.

The success of alternative feed is influenced by the food habit of the fish. To find out the acceptability of fermented *Lemna* sp, research is needed by observing the growth of fish with different food habits, by giving *Lemna* sp as their feed. Tests carried out on catfish (*Pangasius hypophthalmus*) (representing carnivorous fish) and Nile Tilapia (*Oreochromis niloticus*) (representing omnivore fish). These two types of fish are superior commodities of freshwater fish that have high economic value (Mahyuddin 2010), so it is expected that the provision of *Lemna* sp as an alternative feed can support increased fish production as a provider of animal protein for the community.

## METHODOLOGY

The research was conducted at Ciparanje Laboratory and Hatchery Building 4 of the Faculty of Fisheries and Marine Sciences, Padjadjaran University. Analysis of feed ingredients and *Lemna* sp. conducted at the Nutrition Laboratory of the Faculty of Animal Husbandry, Padjadjaran University. The cultivation container used is 15 aquariums, measuring 45cmx35cmx40cm. The fish used in this study were catfish with length of  $\pm$  8-9 cm originating from CDKPWU Subang, and tilapia with length of 5-7 cm originating from BPBIAT Wanayasa. *Lemna* sp. which is used in the experiment comes from nature, and cultivation ponds at Ciparanje Laboratory of FPIK Unpad. The liquid probiotic's brand used for the fermentation process is Akuasimba-d. The test feed used is artificial food in the form of dry pellets in the form of crumble. The feed is composed of commercial feed and *Lemna* sp meal. fermented products (TLF). The method used in this study is an experimental method with Completely Randomized Design (CRD), consisting of 4 treatments and 3 replications. With the treatments as follow:.

Treatment A: Commercial feed 70% TLF 30%

Treatment B: Commercial feed 60% TLF 40%

Treatment C: Commercial feed 50% TLF 50%

Treatment D: Commercial feed 40% TLF 60%

## RESULTS AND DISCUSSION

### Daily Growth Rate

Growth is the process of increasing in volume size and weight of an organism, which can be seen from the change of length and weight in a certain period of time (Putra et al 2014). In general, growth is often used as a parameter used to determine the effect of feed on fish.

Tabel 1. Daily Growth Rate

Treatment	Average of Daily Growth Rate (%)	
	Catfish	Nile Tilapia
A (30)	1.12 $\pm$ 0.04c	1,40 $\pm$ 0,38b
B (40)	1.04 $\pm$ 0.03c	1,26 $\pm$ 0,26b
C (50)	0.88 $\pm$ 0.05b	0,80 $\pm$ 0,09a
D (60)	0.70 $\pm$ 0.05a	0,76 $\pm$ 0,13a

The effect of giving fermented *Lemna* sp. meal on the daily growth rate of catfish and tilapia were analyzed using the F Test at 95% confidence level. The F test shows a significantly different result. The addition of higher percentage of *Lemna* sp to the feed causes a decrease in the value of the daily growth rate in catfish and tilapia. Likewise, food habit differences affect the growth rate, several behavioral responses, feeding habits, frequency of feeding, food detection mechanisms, and food preferences (Santosh and Tibbetts, 2009). Table 2 shows that the growth rate of tilapia is higher compared to catfish at the same dosage of *Lemna* sp. In treatments A and B were significantly different from treatments C and D but treatment A was not significantly different from treatment B. Duncan's test result shows that the administration of 50% *Lemna* sp in feed significantly reduced the growth rate of catfish and tilapia. However, based on the value of the growth rate above, it indicates that the feed provided during the study can be utilized for fish's growth. This can be seen based on the increasing value of the length and weight of the fishes during cultivation.

The level of feed utilization by fish is influenced by the quality of feed ingredients used. The fermentation process in *Lemna* sp. is known to reduce crude fiber content and improve the quality and digestibility. This can be seen in Saputra's (2017) study that the administration 40% of unfermented *Lemna* sp. in artificial feed generate a daily growth rate of 0.30%. While the addition of 40% of fermented *Lemna* sp. Meal in commercial feed generate a daily growth rate of 1.04%. The low value of the growth rate with the addition of non-fermented *Lemna* sp. due to the high content of crude fiber and vegetable protein in feed can inhibit the daily growth rate and cause more energy to be used to digest feed.

The *Lemna* sp in this study was fermented first, so there was an increase in protein content and a decrease in crude fiber, which caused an increase in the daily growth rate of fish (Table 1). This is in line with Handajani (2007) who stated that the advantage of the fermentation process is including an increase in nutrition and storing power, because the fermentation process will remodel complex compounds into simpler compounds, so that they are easily absorbed by the body.

Rostika et al (2017) studies showed that 30 % and 40% administration of *Lemna* sp. Resulted in daily growth rate of 1.10% and 0.83%. While this study proved that with the administration 30% and 40% of fermented *Lemna* sp. Fermentation in artificial feed resulted in daily growth rate of 1.12 and 1.04%. This shows that the value obtained in this study is better than that of Rostika et al (2017). These results may be caused by differences in probiotics used in the fermentation process of *Lemna* sp. in this study. Aquasimbad probiotics were used for fermentation while in Rostika et al (2017) EM4 was used as a probiotic in the fermentation process; Where the number of microbial colonies in Aquasimbad probiotics is more than that of EM4 probiotics. The number of microbial colonies in Aquasimbad probiotics was  $10^8$ - $10^9$  while probiotics EM4 had  $10^7$  microbial colonies (Merdana 2016).

## Survival Rate

Fish survival is influenced by factors such as age and adaptability to the environment while external factors including abiotic conditions, competition between species, and high density of fingerlings during cultivation. The following is the survival value of Siamese catfish and Nile tilapia in each treatment with cultivation period of 40 days.

Tabel 1. Survival Rate

Treatment	Average of Daily Growth Rate (%)	
	Catfish	Nile Tilapia
A (30)	100,00a	82,22 ± 13,88a
B (40)	100,00a	75,56 ± 10,18a
C (50)	100,00a	77,78 ± 13,88a
D (60)	100,00a	75,56 ± 10,18a

Note: Means with a common superscript letter in the same column were not significantly different ( $P > 0.05$ ) by Duncan's test

Based on the data obtained, the survival rate of Siamese catfish from all treatments was 100%, while the survival of tilapia is the highest in the addition of 30% *Lemna* sp (82.22%). Compared with the results of a study by Rostika et al (2017), the administration of 40% of fermented *Lemna* sp. on commercial feed provides a survival value of 72-84% in tilapia fingerlings. Suhendar's (2017) study showed that the administration of 40% of fermented *Lemna* sp. in Tawes fish meal resulted in survival rate of 93.94%. Thus the result of administration of fermented *Lemna* sp. in artificial feed shows that it has no negative effect on fish survival.

The high survival rate of fish is influenced by a number of external factors, such as the environmental conditions. Once a day, the aquariums were syphoned before giving food to ensure that the quality of water during cultivation is always well maintained. Khairuman and Suhenda (2002) supported the claim that good water quality during cultivation provided wellbeing for the fish. According to Effendi (2006), good water quality will affect fish life and fish growth

## Water Quality

The water quality parameters observed during the study were temperature, dissolved oxygen and pH. The following is the water quality data obtained during the study (Table 4).

Table 2. Water Quality

Treatment	Start and End		
	Temperature (°C)	DO (mg/L)	pH
A (30%)	28,7-30,1	4.3-6,1	7,45-7,67
B (40%)	29,2-30,3	5,4-6,1	7,35-7,58
C (50%)	29,6-30,2	4.3-5.9	7,44-7,67
D (60%)	28,9-30,4	4.4-6,2	7,35-7,56

Based on the data from the measurement of water quality during the study, the temperature range obtained from all treatments was not much different, ranging from 28.4°C-30.4°C. Heater was added to keep the temperature stable. This result is in accordance Susanto's (2009) statement that stated that the optimal temperature range for fish growth is 25°C-30°C.

The pH range obtained during the study was 7.25-7.68. These results are still within the pH tolerance limit for catfish, because according to Kordi (2007) fish growth will be hampered and fish are very sensitive to bacteria and parasites at pH 5 - 6.5. Meanwhile at pH 7-8 new fish can grow optimally. This is in accordance with Susanto's statement (2009) that the optimum pH range that is suitable for catfish is around 6.7-8.6.

Oxygen content is in the range of 4.3-6.2 mg / L. The results obtained are still within tolerance limits based on SNI for fish farming in fresh water. According to SNI (2000) Dissolved oxygen for fish should be more than 4 mg / L. The dissolved oxygen content is quite good due to the addition of an aeration installation which can increase the dissolved oxygen content in the maintenance media. If the dissolved oxygen content is low, it will cause decreased appetite which will affect the growth rate of fish.

## CONCLUSION

Based on the results of the research that has been done, it can be concluded that 30% administration of fermented *Lemna* sp. in artificial feed provides the best growth rate value for herbivorous and carnivorous fish. The highest growth rate in catfish is 1.12% and tilapia is 1.40%. While the survival of catfish is 100% and tilapia is 82.22%.

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