The Effect of Different level of Probiotic Addition on Commercial Feed against Digestibility and Efficiency of Nile Tilapia Feed (*Oreochromis Niloticus*)

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The Effect of Different Level of Probiotic Addition on Commercial Feed against Digestibility and Efficiency of Nile Tilapia Feed (*Oreochromis niloticus*)

D Taufik, M Arief and H Kenconojati

**Abstract.** Tilapia cultivation is intensively developed by relying on commercial feed to increase production. This has led to an increase in production costs in tilapia cultivation. One effort to improve feed efficiency is by adding probiotics. The working mechanism of probiotic bacteria increases the value of feed digestibility. This enables fishes to optimally absorb feed nutrients which results in the increasing value of feed efficiency and reduce in production costs. The research was conducted on March 19 to April 21, 2018 at Balai Ikan Ikan Kabat, Banyuwangi. The design used in this study was a completely randomized design with 4 treatments and 5 replications. The results of the study indicated that the addition of probiotics to commercial feed was able to show significant differences (p<0.05) on protein and fat digestibility, but did not show significant differences (p> 0.05) on the value of tilapia fish feed efficiency.

**Key Words:** Digestibility, Feed Efficiency and Probiotics.

1. Introduction

1.1. Background of the Study

Tilapia cultivation is intensively developed by relying on commercial feed to increase production. This has led to an increase in production costs in tilapia cultivation. The feed costs in fish farming can reach almost 70% of all production costs [8]. Therefore, it is necessary to put efforts to improve the feed efficiency in order to increase production of aquaculture and in the same time to reduce the cost of feed procurement [2]. Several ways are done to improve feed efficiency such as feed formulations, feed substitution and the addition of *feed additives* by optimizing the digestion of fish by feed absorption [4].

One effort to improve feed efficiency is by adding probiotics. Research conducted by [1] shows that probiotics in commercial feed can provide good feed efficiency, so that it can be used in feed and can reduce feed costs.

There are several number of probiotic products on the market with various compositions of bacteria in it and wide range of prices starting with expensive, medium and cheap probiotics. Research needs to be able to prove which probiotics are good and suitable to be used in increasing feed digestibility and feed efficiency of tilapia. Therefore, the probiotics can be utilized efficiently in terms of use and in terms of production costs.

1.2. Purpose of the Study

The purpose of this study is to determine the effect of different probiotic additions on digestibility and feed efficiency of tilapia (*Oreochromis niloticus*).

2. Implementation
2.1. The Place and Time
The study was conducted from March to April 2018 at Balai Ikan Ikan Kabat, Banyuwangi. The proximate analysis of feed digestibility was conducted at the Fish Nutrition Laboratory, Faculty of Veterinary Medicine, Universitas Airlangga, Surabaya.

2.2. The Working Methods
The method used in this research was experimental method to investigate the possibility of interrelated causation between phenomena using one treatment/more control group that was not subject to treatment. The experimental design used was a completely randomized design (CRD) consisting of 4 treatments and 5 replications. The determination of probiotic doses was based on the study [7] with optimal probiotic doses of 10 ml/kg of feed. The treatments used were as follows:

- Treatment 0: Feed without probiotic addition (Control)
- Treatment 1: Feed with addition of probiotics A (10 ml/kg) Treatment 2: Feed with addition of probiotics B (10 ml/kg) Treatment 3: Feed with addition of probiotics C (10 ml/kg)

The treatment was conducted for 30 days. The feeding was undergone three times a day at 08.00, 12.00 and 17.00. Fish were given at satiation and use as much as 5% per day from the weight of biomass during maintenance. The sampling of fish weight was done once every seven days. The calculation of the digestibility value of crude protein and crude lipid was conducted 1 time at the end of treatment. It was done by comparing the nutrient content of the feed with the nutrient content that was absorbed by the fish through feces. The digestibility observation is conducted by performing surgical techniques. Furthermore, the calculation of tilapia feed efficiency was undergone at the end of the study. This calculation was done by calculating the amount of feed consumed, the weight of fish biomass at the end of the study and the total weight of fish that died during the study.

3. Results and discussion

Table 1. Average value of rough tilapia protein

| Treatment          | The Digestibility value of Crude Protein± SD |
|--------------------|---------------------------------------------|
| P0 (Without Probiotic) | 89.1820 ± 1.6582c                     |
| P1 (Probiotic A)    | 92.5400 ± 0.6353a                      |
| P2 (Probiotic B)    | 93.6480 ± 0.6672a                      |
| P3 (Probiotic C)    | 90.6380 ± 0.9662b                      |

Description: P0: Without the administration of probiotics (controls), P1: Probiotics A, P2: Probiotics B and P3 Probiotics C. Different superscripts in the same column show differences (p < 0.05). SD = Standard Deviation.

The highest value of crude protein digestibility was obtained in P2 treatment (probiotics B) with a value of 93.64%, followed by P1 (probiotics A) with a value of 92.54%, followed by P3 (given probiotics C) with a value 90.63% and the lowest crude protein digestibility value was found in treatment P0 (without the addition of probiotics) with a value of 89.18%.

Table 2. The average value of crude lipid digestibility for tilapia

| Treatment of        | Value of Crude Fat± SD |
|---------------------|------------------------|
| P0 (Without Probiotic) | 85.7860 ± 1.2830c        |
| P1 (Probiotic A)    | 89.2740 ± 1.7753b        |
| P2 (Probiotic B)    | 91.9320 ± 0.6719a        |
| P3 (Probiotic C)    | 88.7590 ± 2.5624b        |
Description: P0: Without the administration of probiotics (controls), P1: Probiotics A, P2: Probiotics B and P3 Probiotics C. Different Superscripts on the same column shows a difference (p <0.05). SD = Standard Deviation.

The highest crude lipid digestibility value was obtained in P2 treatment (probiotics B) with a value of 91.93% followed by P1 (probiotics A) with a value of 89.27%, then P3 (probiotics C) with a value 88.04% and the lowest crude lipid digestibility was obtained in P0 (without probiotics) at a value of 85.78%.

Table 3. The feed efficiency value of tilapia

| Treatment                  | Feed Efficiency Value ± SD |
|----------------------------|-----------------------------|
| P0 (Without Probability)  | 79.9200 ± 10.110\textsuperscript{b} |
| P1 (Probiotic A)           | 87.9340 ± 6.371\textsuperscript{ab} |
| P2 (Probiotic B)           | 91.7220 ± 5.049\textsuperscript{a} |
| P3 (Probiotics C)          | 83.8380 ± 2.844\textsuperscript{ab} |

Description: P0: Without the provision of probiotics (controls), P1: Probiotics A, P2: Probiotics B and P3 Probiotics C. The same superscript in the column shows no difference (p > 0.05). SD = Standard Deviation.

The calculation results analysis of variance (ANOVA) show that the treatment produces insignificant different (p>0.05) efficiency value of tilapia feed. The good value of feed efficiency was obtained by P2 treatment with a value of 91.72% followed by P1 treatment with a value of 87.93. It was followed by P3 treatment with a value of 83.83 and the lowest feed efficiency value was obtained by P0 with a value of 79.92%.

The suspected factor that caused P2 treatment to reach the highest digestibility value was the total bacterial amount of probiotics given which was set at 1.5 x 10\textsuperscript{12} Cfu/ml. This number was higher compared to the number of probiotics bacteria in other treatments. Particular different numbers of bacteria contained will increase the chance of probiotic bacteria to be absorbed by fish’ digestive system. These absorbed bacteria could help fish to hydrolyze proteins to its simplified version called amino acids. Therefore, the nutrients absorption was increased. This was translated to the point where the more bacteria absorbed could help the nutrient intake (Kurniawan et al., 2016). The P0 shows the lowest digestibility value of crude protein and crude fat compared to other treatments, this was due to the lack of support from bacterial and activity yeast which was able to produce digestive enzymes. Therefore, the digestive process became less optimal.

Feed efficiency values were obtained from the comparison between fish body weight gain and the amount of feed consumed by fish during the maintenance period. The greater the value of feed efficiency was, the more efficient was the fish in using the feed consumed for their growth [3].

The results of statistical analysis showed that P2 had the highest feed efficiency value with a value of 91.72%, this occurred due to the help of probiotic bacteria Lactobacillus sp., Bifidobacterium and Bacillus sp. The process of degradation of complex molecules became simpler so that the digestion and absorption of feed mixed with probiotics B could be effectively absorbed to increase the weight of tilapia and the percentage of feed converted into meat increases. In accordance with statement [6] that high feed efficiency indicated efficient use of feed due to the protein contained in feed not being widely used to meet energy needs in the metabolism, osmoregulation and reproduction process. However, it was more widely used for growth.

P0 treatment (without the addition of probiotics) showed the lowest feed efficiency value compared to the other treatments. This was caused by the lack of absorption of feed and the result of less optimal absorption activities because it was not helped by probiotic batteries. Feed efficiency was also influenced by the total probiotics in the fish digestive tract (Anwar, 2015). It was reinforced by the
idea [5] that feed without the provision of probiotics will not increase digestive enzymes. The process of protein hydrolysis into simpler compounds was not optimal and causes less optimal protein absorption and slow growth. This will affect the level of feed efficiency because the food consumed did not match the weight gain.

4. Conclusion
Based on the results of the research conducted on the addition of different probiotics to tilapia, it can be concluded that the addition of different probiotics to commercial feed on tilapia has a positive effect, that is to increase digestibility and feed efficiency of tilapia (Oreochromis niloticus).

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