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Effect of lysine in addition to commercial feed on crude protein and the energy digestibility of gourami (*Osphronemus gouramy*)

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Effect of lysine in addition to commercial feed on crude protein and the energy digestibility of gourami (*Osphronemus gouramy*)

D Setiawan¹, S H Samara¹, Agustono^{1*} and M A A Arif²

¹Department of Aquaculture, Faculty of Fisheries and Marine, Universitas Airlangga, Surabaya East Java, Indonesia, 60115

²Department of Oceanology, Faculty of Fisheries and Marine, Universitas Airlangga, Surabaya East Java, Indonesia, 60115

*Corresponding author: denisetiawan97@ gmail.com

Abstract. Gourami (*Osphronemus gouramy*) are one of the fish species with a high economic value. The increase in gourami consumption has caused a high demand, yet its rearing still faces many problems, especially related to growth. Gourami have a slow growth rate. Lysine is an essential amino acid, which plays a role in the establishment of carnitine, which functions to accelerate growth. Food digestibility is defined as the amount of non-excreted nutrients through stool based on the assumption that the food is ingested by the fish. This research aimed to assess the effect of lysine when in addition to commercial feed and its effect on crude protein and the energy digestibility of gourami (*Osphronemus gouramy*). The research used an experimental method with a completely randomized design (CRD) with five treatments and four replications. The lysine doses added to the commercial feed were P0 (0%), P1 (1%), P2 (1.5%), P3 (2%) and P4 (2.5%) respectively. The parameters observed in this research were crude protein digestibility and the energy digestibility of the gourami. The data analysis used analysis of variance (ANOVA). The results showed that the average value of the crude protein digestibility in each treatment was $95,515 \pm 1,868\%$; $96,840 \pm 1,256\%$; $97,158 \pm 1,426\%$; $97,825 \pm 0,652\%$ and $97,088 \pm 1,512\%$ respectively. The average energy digestibility for each treatment was P0, P1, P2, P3 and P4 being $96,480 \pm 2,160\%$; $97,075 \pm 1,990\%$; $97,360 \pm 1,898\%$; $97,848 \pm 96,313 \pm 0,871\%$ and $2,887\%$ respectively. The results showed that the addition of lysine in commercial feed has no impact and shows there to be no significant difference ($p > 0.05$) on the crude protein and energy digestibility of gourami.

1. Introduction

Gourami (*Osphronemus gouramy*) are a commercial fish with a high economic value. The increased consumption of gourami causes a high demand, but currently the production of gourami is still low and unable to meet the market demand [1]. The development of the gourami business still faces many obstacles, especially focused on growth problems. Gourami have a slow growth rate [2]. The culture period of gourami from egg hatching to reaching consumption size (500 g) is 1.5 years, so there needs to be an effort to accelerate the growth rate of gourami [3].

So far, gourami fish farmers have used commercial food with various levels of protein content, but gourami growth has still tended to be slow. Therefore, feed supplements need to be added to feed in order to induce growth and to further increase fish productivity and health as well as its production efficiency [4,5]. One feed supplement that can be added to feed is lysine. Lysine is one of the essential



amino acids for fish. It plays a role in the formation of carnitine, which is needed in the process of fat metabolism in order to produce energy [6,7].

Food substance digestibility is defined as the amount of food that is not excreted through feces with the assumption that the food substance is digested by the animal [8]. The measurement of digestibility is an attempt to determine the amount of feed substance absorbed in the digestive tract. The amount left in the animal's body or the amount of the digested feed ingredient is the difference between the excreted and consumed feed substance [9]. Rough protein digestibility is the amount of consumed feed protein that is not excreted through the feces. Digestible energy is the total feed energy consumed that is not excreted through feces. The lysine additions to commercial feed are expected to improve the digestibility of crude protein and thus, the energy of gourami.

2. Materials and method

2.1 Materials

Twenty aquariums with a dimension of 40 x 25 x 25 cm were set up with aeration. Other materials, namely fish nets, digital scales, a pH meter, a thermometer, a DO test, ammonia test, and siphoning tools, were also prepared at the Wet Laboratory in the Faculty of Fisheries and Marine of Universitas Airlangga.

Gourami (*Osphronemus gouramy*) with a length of 8-10 cm were used, 10 for each aquarium, so there were 200 gourami in total. The fish were reared in a fresh water medium with a water volume of 15 liters per aquarium. The feed used in this study consisted of pellets made from commercial feed, tapioca flour, and lysine amino acid. Proximate analysis was conducted at the Feed Laboratory of the Veterinary Faculty of Universitas Airlangga, Surabaya.

2.2. Method

2.2.1 Fish rearing

This study started from the equipment preparation by cleaning the tools. The aquaria were washed with chlorine prior to the study to remove any microbes, and then were rinsed and dried. The freshwater media was set and aerated before use. Upon stocking, the gourami were acclimatized for 30 minutes.

The test feed used in this study was dry commercial feed with lysine (the protein content in lysine is 64.9414%) and tapioca flour, which acts as a binder or adhesive with a dose according to the treatment. P0 had no lysine (control), P1 had 1% lysine, P2 had 1.5% lysine, P3 had 2% lysine, and P4 had 2.5% lysine. Prior to the test, the gourami fasted for 1 day to remove the remaining feed from the previous gourami breeder. Feeding was conducted three times per day (morning: 8:00 a.m., afternoon: 12:00 p.m., evening: 16:00) with a feeding rate of 3% of the gourami biomass. During the rearing, the aquariums were siphoned every morning to clean them of the remaining feed and feces.

On day 34, the fish were fed once in the morning and fasted for 24 hours to empty its stomach. On day 35, the fish were fed until the fish stopped eating. After 7 hours of feeding, the fish activity was halted and surgery was performed to retrieve the feces in the colon. The surgery was performed until the fish feces were completely retrieved and exhausted, and proximate analysis was performed on the samples.

2.2.2 Data analysis

This study used an experimental method with a completely randomized design (CRD). There were 5 treatments and 4 replications used to assess the dose of the lysine. The measured parameters were the crude protein and energy digestibility of gourami. After being transformed, the data was analyzed using Analysis of Variants (ANOVA) to determine whether there was an effect from the lysine addition to the commercial feed on the crude protein and energy digestibility value of gourami. The statistic calculations were performed using the SPSS version 23 application.

3. Results

3.1 Crude protein digestibility

The crude protein digestibility value of gurami ranged between 95.515% and 97.825%. The average value of the crude protein digestibility of gourami can be seen in Table 1.

Table 1. Average Value of the Crude Protein Digestibility of Gourami Fish

Treatment	Crude Protein Digestibility (%) \pm SD	Transformation ($\sqrt{}$) \pm SD
P0 (0% lysine)	95.515 \pm 1.868	9.773 \pm 0.098
P1 (1% lysine)	96.840 \pm 1.256	9.840 \pm 0.064
P2 (1.5% lysine)	97.158 \pm 1.426	9.858 \pm 0.074
P3 (2% lysine)	97.825 \pm 0.652	9.893 \pm 0.031
P4 (2.5% lysine)	97.088 \pm 1.512	9.853 \pm 0.078

Note: SD = Standard Deviation

Based on Table 1, it can be determined that the highest value of the average crude protein digestibility was obtained in treatment P3 (2% lysine) at 97.825% and the lowest was found in P0 (0% lysine) at 95.515%. The Analysis of Variant (ANOVA) results showed there to be no significant differences among the treatments ($p > 0.05$) based on the value of crude protein digestibility in the gourami.

3.2 Energy digestibility

The energy digestibility of the gourami ranged between 96.313% and 97.848%. The average value data of the gourami's energy digestibility can be seen on Table 2.

Table 2. Average Value of the Gourami Fish Energy Digestibility

Treatment	Energy digestibility (%) \pm SD	Transformation ($\sqrt{}$) \pm SD
P0 (0% lysine)	96.480 \pm 2.160	9.825 \pm 0.111
P1 (1% lysine)	97.075 \pm 1.990	9.850 \pm 0.098
P2 (1.5% lysine)	97.360 \pm 1.898	9.868 \pm 0.095
P3 (2% lysine)	97.848 \pm 0.871	9.893 \pm 0.043
P4 (2.5% lysine)	96.313 \pm 2.887	9.815 \pm 0.149

Note: SD = Standard Deviation

4. Discussion

The crude protein digestibility in this study showed there to be no significant differences. This is caused by the lysine used in this study which had a protein content of only 64.9414%. Lysine commonly contains protein between 98.5% and 99% [10–12]. The low protein content in lysine (lower than 98.5% to 99%) will result in low protein content in the feed, eventually reducing the protein consumption in the feed; thus, the protein content in the consumed food affects the crude protein digestibility [13,14]. Feed with a low protein content or containing less than what the fish needs will have lower digestibility value and vice versa.

Based on Table 2, it can be determined that the average value of the highest energy digestibility was obtained by the P3 treatment (2% lysine) of 97.848% and the average lowest energy digestibility was obtained by the P4 treatment (2.5% lysine) of 96.313%. The ANOVA calculation showed there to be no significant difference among treatments ($p > 0.05$), which means that all of the treatments similarly affect the energy digestibility of the gourami fish. The similar energy digestibility among the

treatments is caused by the relatively similar energy content of the feed which already meets the fishes energy need of 2409 - 2711 kcal/kg [15].

Lysine is an essential amino acid that functions to provide energy through the process of transamination, deamination, and entry into the Krebs cycle. In the preparation of the fish feed, we needed to pay attention to the balance between protein and energy [16,17]. Using feed with low energy content can cause the fish to use some of the protein as a source of energy for metabolism, whereas high energy content in the feed can limit the amount of consumed food. The lower the amount of feed consumed, the lower the digestibility value.

5. References

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