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# Performance of Amino Acid Supplementation in Feed on the Production of Cantang Grouper (*Epinephelus lanceolatus x Epinephelus fuscoguttatus*) in the Nursery Phase

# Performa Penambahan Asam Amino dalam Pakan Terhadap Kinerja Produksi Ikan Kerapu Cantang (*Epinephelus lanceolatus x Epinephelus fuscoguttatus*) pada Fase Pendederan

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**Abstract**

The growth of Cantang grouper is influenced not only by genetic factors but also by the quality of feed, particularly the protein content, which is closely related to amino acid levels. This study aims to investigate the effect of adding commercial amino acids to feed on the growth of Cantang grouper. The research was conducted using an experimental method with a Randomized Block Design (RBD), comprising four treatments and three replicates of amino acid doses added to commercial feed: P0 (0%), P1 (1%), P2 (2%), and P3 (3%). The parameters observed included survival rate, weight growth rate, length growth rate, specific growth rate, and feed conversion ratio. The results showed that adding amino acids to commercial feed over a 21-day rearing period significantly affected all parameters ($p<0.05$). The highest survival rate, weight growth, length increase, and specific growth rate were found in the P2 treatment with the values of 95.00 ± 5.00%, 7.40 ± 0.24 g, 3.69 ± 0.75 cm, 9.83 ± 0.15%/day, respectively. In addition, the lowest feed conversion ratio was obtained in the P2 treatment (1.22 ± 0.03).

*Keywords: Amino acids, Slender Grouper, Growth, Survival, Supplementation*

**Abstrak**

Pertumbuhan ikan kerapu cantang, selain disebabkan oleh faktor genetika juga dipengaruhi oleh kualitas pakan terutama protein yang berhubungan erat dengan kandungan asam amino. Penelitian ini bertujuan untuk mengkaji pengaruh penambahan asam amino komersial pada pakan terhadap pertumbuhan ikan kerapu cantang. Metode penelitian yang digunakan adalah metode eksperimental Rancangan Acak Kelompok (RAK) dengan empat perlakuan dan tiga ulangan dosis asam amino yang ditambahkan pada pakan komersial pada penelitian P0 (0%), P1 (1%), P2 (2%), P3 (3%). Parameter yang diamati yaitu tingkat kelangsungan hidup, pertambahan bobot, pertambahan panjang, laju pertumbuhan spesifik dan rasio konversi pakan. Hasil penelitian menunjukkan penambahan asam amino pada pakan komersial selama 21 hari pemeliharaan memberikan pengaruh yang berbeda nyata ($p<0,05$) terhadap semua parameter. Persentase tingkat kelangsungan hidup terbaik didapatkan pada perlakuan P2 (95,00 ± 5,00 %). Pertambahan bobot tertinggi didapatkan pada perlakuan P2 (7,40 ± 0,24 g). Pertambahan panjang tertinggi didapatkan pada perlakuan P2 (3,69 ± 0,75 cm). Laju pertumbuhan spesifik terbaik didapatkan pada perlakuan P2 (9,83 ± 0,15 %/hari) dan konversi pakan terendah adalah perlakuan P2 (1,22 ± 0,03).

*Kata Kunci: Asam amino, Kerapu Cantang, Pertumbuhan, Sintasan, Suplementasi*

## 1. Introduction

Cantang grouper belongs to the Serranidae family, which is a hybridization of female tiger grouper (Epinephelus fuscoguttatus) with male kertang grouper (Epinephelus lanceolatus) (Nabila & Patria, 2021). The growth of hybrid grouper larvae is faster when compared to tiger grouper because the average length of a 90-day-old hybrid grouper is around 12 cm, while the average length of tiger grouper is around 7 cm.

Factors affecting growth other than genes, sex, age, and weight can also be influenced by feed and environmental conditions. Quality feed will be influential in helping feed efficiency accelerate growth. The tiger grouper aquaculture business activities in floating net cages are obtained from the hatchery process in ponds, which are then raised to consumption size at sea (Effendi *et al.,* 2021). The feed during the breeding phase uses Megami-GR brand pellets specially formulated for grouper. However, this commercial feed does not contain ingredients that

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can increase feed digestibility, so it is necessary to add ingredients that can help increase feed digestibility from outside (Putra *et al.*, 2020).

Protein is a source of essential amino acids used to synthesize non-essential amino acids and proteins in the body. Non-essential amino acids that the body can produce consist of alanine, aspargine, aspartic acid, glutamic acid, cysteine, glycine, ornithine, proline, serine, and tyrosine (Xing *et al.*, 2023). Protein that is consumed and enters the body will then be synthesized into amino acids and can be used for meat formation to increase body weight (Varianti *et al.*, 2017). The suitability of feeding with amino acids contained in the body of grouper fish will be a determining factor in helping to increase the growth rate. Studies on the levels of essential amino acids given as ingredients in commercial feed mixtures for the growth of grouper in the breeding phase have not been expressly described.

## 2. Materials and Methods

*2.1. Time and Place*

This research was conducted precisely in the nursery section at the Center for Marine Aquaculture Research and Fisheries Extension Gondol, Bali. The implementation of the research began in December 2023 - January 2024.

*2.2 Research Design*

The design used in this study was a Randomized Group Design (RAK) consisting of 4 treatments, with each treatment repeated three times. The treatments were no liquid amino acid supplementation (P0), 1% amino acid supplementation (P1), 2% (P2) and 3% (P3). This study used RAK because the research was conducted outdoors with different ponds.

*2.3 Preparation of Maintenance Containers*

The rearing container in this study used 12 units of nets measuring 50 x 50 x 60 cm in length x width x height, respectively. The nets used as rearing containers for the test animals were placed in a concrete pond measuring 2 x 3 m with a water flow rate of 1.125 L/min. The nets as rearing containers were cleaned with clean water and soaked with a salt solution for 2 hours before use. Then, it is grouped based on the randomization of treatments placed in concrete ponds, which are given aeration and running water to ensure optimum dissolved oxygen levels in the rearing containers.

*2.4 Fish and Test Feed*

The grouper used in this study was about 4-5 cm in size and weighed 0.8-1.5 grams. The test fish were obtained from the Center for Marine Aquaculture Research and Fisheries Extension in Gondol, Bali. The grouper fish were kept in a rearing container with 20 grouper fish juveniles in each net. The stocking density should consider the juvenile body's initial size and the rearing age. Optimal grouper growth in floating net cages is 50-60 fish/$m^3$. After that, adaptation is carried out for one day to adjust to the new environment, monitor the movement of fish when moved to a new place, and increase appetite when research begins. Fish in the adaptation period were fed pellets of commercial feed Megami GR-2 with a 2- 2.2 mm feed size.

Feeding for the test fish during rearing uses Megami GR-2 commercial feed specially formulated for grouper with 48% protein, 10% fat, 2% fiber, 10% ash, and 10% moisture content. The feed supplementation process involved mixing commercial amino acids (CV. HW Marine) directly into the feed. The feed used was weighed and mixed with commercial amino acids. This mixing method was carried out by adding 1%, 2%, and 3% of the required feed weight. The weighed feed was then diluted with sufficient distilled water, mixed into the feed, and stirred evenly. The feed that has been mixed with amino acids is then dried and placed in the sun before use so that the amino acids mixed in the feed can be absorbed completely.

*2.5 Research Implementation*

The grouper was cultured and raised for 21 days to meet the target size for stocking in floating net cages. The feeding frequency is done four times daily, namely at 07.00, 10.00, 13.00, and 16.00 WITA, with a feeding rate of 7% of fish biomass. Feeding four times a day, according to Khumaidi *et al.* (2022), in grouper seeds under 5 cm in size can reduce cannibalism, and a higher frequency of feeding will affect growth because if the more significant the frequency of feeding, the greater the weight growth that will be produced. Sampling was conducted twice daily in the morning at 08.00 WITA and in the afternoon at 17.00 WITA. Sampling activities to observe the growth of cantang grouper fish were carried out once every seven days during the maintenance period, namely 21 days.

*2.6 Research Parameters*

The survival rate, according to Nazlia and Zulfiadi (2018), can be calculated using the formula:

$$SR = \frac{Nt}{No} \times 100\%$$

Description:
SR: Seed survival (%)
Nt: Number of fish at the end of rearing (fish)
No: Number of fish at the beginning of rearing (fish)

Weight gain can be calculated using the formula (Siegers *et al.*, 2019):

$$h = Wo - Wt$$

Description:
h: Weight gain (g)
Wt: Weight of test fish at the end of rearing (g)
Wo: Weight of test fish at the beginning of rearing (g)

Length gain can be calculated using the formula according to (Chrisdiana *et al.*, 2015):

$$L = Lt - Lo$$

Description:
L: Length gain (cm)
Lt: Average length at the end of rearing (cm)
Lo: Average length at the start of rearing (cm)

Specific growth rate (SGR), according to Ekaputri *et al.* (2018), can be calculated using the formula:

$$SGR = \frac{(Ln\,Wt - Ln\,Wo)}{t} \times 100\%$$

Description:
SGR: Daily growth rate (%/day)
t: Study time (days)

FCR calculation, according to Mulyani and Fitrani (2014), is as follows:

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

Description:
FCR: Feed conversion ratio
F: Total feed consumption (g)
D: Weight of dead fish (g)

*2.7 Data Analysis*

The data obtained from each treatment were analyzed using Microsoft Excel 2019 and SPSS ver.29. The data to be statistically analyzed included survival rate, weight growth rate, length growth rate, specific growth rate, feed conversion ratio, and feed efficiency. If the data from the ANOVA test shows significantly different results after being analyzed, it is continued with further tests. Further tests use the Duncan test with a 95% confidence interval. Water quality data were presented in tables and analyzed descriptively.

## 3. Results and Discussion

The research results on the provision of amino acids in the breeding phase of cantang grouper with different doses of observation parameters can be seen in Table 1. Water quality parameters are one of the factors that affect the growth and *survival rate of* cultured fish. Water quality parameters during the study can be seen in Table 2.

**Table 1**.
Production performance results of grouper with different amino acid dosage

| Treatment | SR (%) | h (g) | L (cm) | SGR (%/day) | FCR |
|---|---|---|---|---|---|
| P0 (0%) | 85,00±5,00$^{a}$ | 5,40±0,16$^{a}$ | 2,85±0,16$^{a}$ | 8,56±0,11$^{a}$ | 1,42±0,08$^{b}$ |
| P1 (1%) | 93,33±2,88$^{b}$ | 6,42±0,14$^{b}$ | 3,36±0,75$^{b}$ | 9,30±0,17$^{b}$ | 1,40±0,13$^{b}$ |
| P2 (2%) | 95,00±5,00$^{b}$ | 7,40±0,24$^{c}$ | 3,69±0,75$^{c}$ | 9,83±0,15$^{c}$ | 1,22±0,03$^{a}$ |
| P3 (3%) | 83,33±7,63$^{a}$ | 6,80±0,39$^{b}$ | 3,49±1,37$^{bc}$ | 9,56±0,32$^{bc}$ | 1,37±0,02$^{b}$ |

*) Different superscripts in the same column indicate significant differences (P<0.05)

**Table 2**.
Average water quality values during the study

| Parameters | Range | SNI 8306. 2 (2014) |
|---|---|---|
| Temperature (˚C) | 27,5 - 30,6 | 28-32 ˚C |
| pH | 7,9 - 8,25 | 7,5-8,5 |
| DO (ppm) | 4,18 - 4,30 | Minimum four ppm |

The highest percentage of survival rate was obtained in treatment P2 (95.00%), followed by treatment P1 (93.33%), then P0 (85.00%), and followed by P3 (83.33%). Further results of Duncan's test showed significantly different results (p<0.05) on the survival rate during the study. The addition of commercial amino acids to fish feed shows a better survival rate of grouper juveniles when compared to the control treatment. The main factor affecting the growth and health of fish, according to Pratama *et al.* (2017), is influenced by the balance of amino acid components in the feed. The feed given is not only the nutrients needed but must also be considered for the media and other components that can affect the health of cultured fish. Adding amino acids to the feed will be more easily digested and can be utilized by fish to help maintain the health and survival of cultured fish (Salam *et al.,* 2022).

The highest average value of weight gain was obtained in treatment P2 (7.40 g), followed by treatment P3 (6.80 g), then treatment P1 (6.42 g), and treatment P0 (5.40 g). Duncan's further test showed significantly different results (p <0.05) on the weight gain obtained. This is caused by essential amino acids such as methionine, phenylalanine, threonine, and tyrosine, which include non-essential amino acids which include some amino acids needed to support fish growth (Pratama *et al.,* 2017). If the feed nutrients absorbed by the body are more significant than the amount needed by the body, the fish will grow well, which is beneficial for maintaining its body. Increased growth is influenced by the amount of feed consumed and the ability of the organism to utilize feed (Liftanto *et al.,* 2023).

The highest average value of length gain was obtained in treatment P2 (3.69 cm), followed by treatment P3 (3.49 cm), then treatment P1 (3.36 cm), and treatment P0 (2.85 cm). The results of Duncan's further test showed significantly different results (p <0.05) on the length gain obtained in all treatments showed different results. This happens because fish experience growth if the food provided exceeds the energy needs for body maintenance and other body activities, and factors that affect length growth are the daily availability of nutrients (Simanjuntak *et al.,* 2022). This is to the results of the growth of cantang grouper juveniles cultivated during this study, which means that the body length growth of cantang grouper juveniles is slower than with weight growth.

The highest weight growth rate was obtained in the P2 treatment (9.83%/day), followed by the P3 treatment (9.56%/day), then the P1 treatment (9.30%/day) and P0 treatment (8.56%/day). The results of Duncan's further test showed significantly different results (p<0.05) on the specific growth rate obtained in all treatments showed different results in each treatment. The amount of feed given to carnivorous marine fish), in the juvenile stadia amounted to 6-8% of the biomass weight of the fish because, in the juvenile stadia, fish to support growth requires a higher amount of feed than in adult stadia. The results show that the digestion process of feed added with 2% amino acids in the feed can be more easily digested so that it can be utilized by the body efficiently, which can be beneficial for growth. Amino acids will synthesize new proteins in several tissues. This protein will be needed to maintain the body, form tissues, and add body protein to support the growth process (Arief & Manan, 2016).

The highest average value of feed conversion was obtained in the P0 treatment (1.42), followed by the P1 treatment (1.40), then P3 (1.37), and followed by P2 (1.22). Further results of Duncan's test showed significantly different results (p<0.05) on the feed conversion ratio obtained. This shows the lowest FCR value with the amount of feed as much as 1.22 g can support growth. The best FCR results can be caused by the addition of commercial amino acids mixed in the feed, which causes the feed to be of better quality because amino acids help add nutrients to the feed. High FCR results were found in the P0 treatment with feed not mixed with amino acids. The cause of the high feed conversion ratio, according to Arief and Manan (2016), is underutilized feeding, so the nutrients in the feed are not maximally absorbed, which ends up being wasted through feces. This causes unutilized feeding, so the growth rate will be relatively low. The high growth rate and effectiveness of fish feed utilization will have a good impact on the value of the feed conversion ratio (Ariadi *et al.,* 2022). The feed conversion ratio value describes how effectively fish digest the feed eaten. The effectiveness of feed utilization by fish is influenced by the frequency and method of feeding (Madusari *et al.,* 2022).

## 4. Conclusion

The addition of amino acids to commercial feed has a significant effect on absolute weight growth and specific growth rate in grouper juveniles. The dose of amino acid 2% of feed weight is the best, and the results were obtained in weight gain (7.40 ± 0.24 g), specific growth rate (9.83 ± 0.15 %/day), and length gain (3.69 ± 0.75 cm). Adding amino acids to commercial feed can increase the survival rate of cantang grouper juveniles at a dose of 2% of feed weight by (95.00 ± 5.00%). In addition, giving a dose of amino acids as much as 2% in the feed shows a low feed conversion ratio (1.22 ± 0.03).

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