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THE EFFECT OF PERIODIC FASTING ON THE GROWTH PERFORMANCE OF SALINE TILAPIA *Oreochromis niloticus*

Pengaruh Puasa Secara Periodik Terhadap Kinerja Pertumbuhan Ikan Nila Salin *Oreochromis niloticus*

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ABSTRACT

Saline tilapia (*Oreochromis niloticus*) is Indonesia's leading cultivation commodity and has important economic value. The general problem in increasing *O. niloticus* production is the high cost of feed. Feed starvation is an alternative to increase feed utilization efficiency and growth performance. The aim of this research was to determine the effect of periodic feed starvation on the growth of saline tilapia. The research was designed in a completely randomized design, four treatments with three replications with different levels of food fasting, namely treatment A: Daily feeding without periodic fasting, Treatment B: 1 day fasting, 3 days fasting periodically, treatment C: 1 day fasting. 5 days fed periodically, treatment D: 1 day fasted 7 days fed periodically. A total of 120 saline tilapia fry were reared for 35 days, given a feed dose of 3% of body weight. The results of the research showed that saline tilapia seeds treated with 1 day fasting for 7 days and fed periodically produced the highest feed efficiency (0.58%), feed conversion ratio (2) and daily growth rate (0.14%) compared to other treatments.

Keywords: Fasting, Feed, Growth, *Oreochromis niloticus*

ABSTRAK

Ikan nila salin (*Oreochromis niloticus*) merupakan komoditas budidaya unggulan Indonesia dan bernilai ekonomis penting. Permasalahan secara umum untuk meningkatkan produksi *O. niloticus* yaitu tingginya biaya pakan. Pemuasaan pakan merupakan alternatif untuk meningkatkan efisiensi pemanfaatan pakan dan kinerja pertumbuhan. Tujuan penelitian ini untuk mengetahui pengaruh pemuasaan pakan secara periodik terhadap kinerja pertumbuhan benih ikan nila salin. Penelitian didesain dalam rancangan acak lengkap, empat perlakuan tiga ulangan dengan tingkat pemuasaan pakan berbeda, yaitu perlakuan A : Pemberian pakan setiap hari tanpa pemuasaan secara periodik, perlakuan B : 1 hari dipuasakan 3 hari di beri pakan secara periodik, perlakuan C : 1 hari dipuasakan 5 hari di beri pakan secara periodik, perlakuan D : 1 hari dipuasakan 7 hari di beri pakan secara periodik. Sebanyak 120 ekor benih ikan nila salin dipelihara selama 35 hari, diberi pakan dosis 3% dari bobot tubuh. Hasil penelitian,

menunjukkan benih ikan nila salin dengan perlakuan 1 hari dipuasakan 7 hari di beri pakan secara periodik menghasilkan efisiensi pakan (0,58%), rasio konversi pakan (2) dan laju pertumbuhan harian (0,14%) tertinggi dibanding perlakuan lainnya.

Kata Kunci: *Oreochromis niloticus*, Pakan, Puasa, Pertumbuhan.

INTRODUCTION

Saline tilapia (*Oreochromis niloticus*) is one of Indonesia's leading commodities and is popular with the public for its supply of animal protein (Aldi *et al.,* 2022; Lusiana *et al.,* 2022). *O. niloticus* cultivation with a high stocking density system has the potential to be developed to support economic resilience and national food security (Utami *et al.,* 2022; Soeprijanto *et al.,* 2023). Saline tilapia is a freshwater tilapia fish that was developed into a tilapia fish that is able to tolerate wide salinity/euryhaline, with a salinity range of 0 - 35 ppt (Haryadi *et al.,* 2015). The prospect of cultivating saline tilapia is very wide open, with international market demand of USD 14.4 billion or IDR 230 trillion in 2024 (KKP, 2024).

Feed is an important factor that must be considered in efforts to increase the productivity of farmed fish (Kasman *et al.,* 2022). However, the problem that often arises in fish rearing is high feed costs, namely more than 60% of the total production costs of fish being raised (Ragasa *et al.,* 2022). The method to increase the efficiency of feed utilization and accelerate growth is by starvation of feed (Assan *et al.,* 2021). Liang-Lu *et al.,* (2019) reported that the method of fasting zebrafish for certain periods had an impact on increasing the optimization of nutrient utilization, minimizing stress due to low temperatures by modulating lipid catabolism and autophagy. Furthermore, it was also reported by Laheng *et al.,* (2020) that the periodic feed fasting method produced a better feed conversion ratio compared to fish without fasting. Tanjung *et al.,* (2023) also stated that starving *feed* on koi carp seeds *Cyprinus carpio* caused faster growth compared to without fasting.

Based on this, it is important to conduct this research with the aim of analyzing the effect of periodic food starvation periods on the growth performance of fish fry Saline tilapia *O. niloticus.*

METHODS

This research was carried out from August to September 2023 at the Aquaculture Laboratory, Aquaculture Study Program, Faculty of Agriculture, Muhammadiyah Makassar University, Jl. Sultan Alauddin No.259, Makassar City, South Sulawesi 90221. The research design used an experimental method with a completely randomized design (CRD), consisting of 4 treatments, 3 repetitions each. The test fish used saline tilapia seeds measuring 3 cm from BPBAP Takalar. The feed uses the PF 1000 brand. The research container uses 12 plastic basins, 40 cm in diameter with a capacity of 10L, and filled 80% and equipped with aeration to supply oxygen. The stocking density of test fish is 1 fish/1 liter of water.

The research treatment dosage refers to research by Rosady *et al.,* (2012) modified, as follows: Treatment A: Feeding every day without periodic fasting, treatment B: 1 day fasting, 3 days feeding periodically, treatment C: 1 day fasted for 5 days and fed periodically, treatment D: 1 day fasted for 7 days fed periodically. Feeding of 3% of body weight is carried out at a feeding rate, with a feeding frequency of three times a day, namely at 08:00, 12:00 and 16:00 WITA referring to Kasman *et al.,* (2022) modified.

Feed Efficiency

Measuring feed efficiency aims to find out how much feed is consumed during maintenance. Feed efficiency (FE) is analyzed based on the formula (Takeuchi *et al.,* 1988), with the formula:

$$FE = \frac{(Wt + Wa) - Wo}{F} x\ 100\%$$

Information:
FE = Feed efficiency (%)
Wo = Shrimp weight at the start of the study (g)
Wt = Weight of shrimp at time t (g)
Wa = Weight of shrimp that died during the study (g)
F = Weight of feed consumed during the study (g)

Feed Conversion Ratio (FCR)

Feed conversion ratio or feed conversion ratio is calculated according to the formula used by Tacon (1987), namely:

$$FCR = F / (Wt - Wo)$$

Information:
FCR = Feed Conversion Ratio
F = Amount of feed consumed (gr)
Wo = Biomass of saline tilapia seeds at the start of the study (gr)
Wt = Biomass of saline tilapia at the end of the study (gr)

Daily Length Growth Rate

Daily length growth measurements were carried out at the beginning and end of maintenance. The formula used to calculate the daily length growth rate is according to Sari *et al.,* (2017):

$$DLGR = \frac{Ln\ Lt - LnLO}{t} x\ 100\%$$

Information:
DLGR = Daily length growth rate (%/day)
Lt = Average length of fish at the end of rearing (cm)
Lo = Average length of fish at the start of rearing (cm)

Data Analysis

The test results which included feed efficiency, feed conversion ratio and daily length growth rate for each treatment were analyzed using variance, if there were differences between treatments then continued using the Duncan test at a 95% confidence interval using the SPSS version 26 program.

RESULT

Feed Efficiency

The results of the research showing the efficiency of feeding saline tilapia seeds that are not fasted compared to those that are periodically fasted are presented in Figure 1.

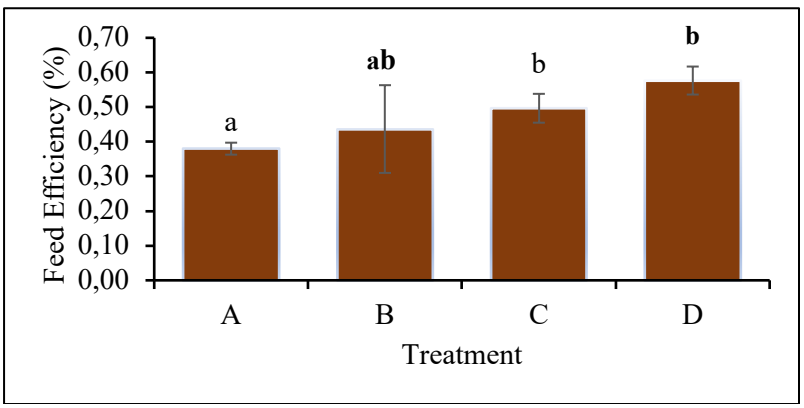

Figure 1. Feed Efficiency of Saline Tilapia Fry that are Periodically Fasted

Based on the results of analysis of variance (Figure 1), saline tilapia seeds that are periodically fasted have a significant effect (P<0.05) on feed efficiency. Duncan's further tests showed that the efficiency of feeding saline tilapia seeds with treatment of 1 day of fasting for 5 days of periodic feeding in treatment C and 1 day of fasting of 7 days of periodic feeding in treatment D was significantly higher than the other treatments. Furthermore, feeding every day without periodic fasting in treatment A and 1 day of fasting for 3 days of periodic feeding in treatment B were significantly lower than the other treatments.

Feed Conversion Ratio

The feed conversion ratio for saline tilapia fingerlings reared during the study is presented in Figure 2.

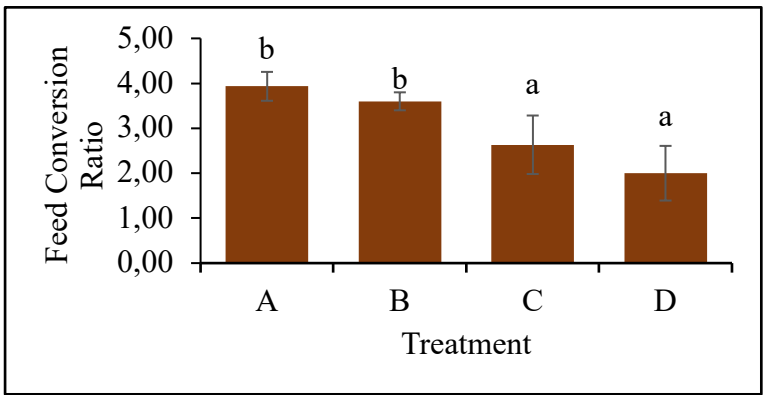

Figure 2. Feed Conversion Ratio for Saline Tilapia Fish that are Periodically Fasted

Based on Figure 2, it shows that periodic fasting has a significant effect (P<0.05) on the feed conversion ratio. The lowest average value for the feed conversion ratio was obtained in treatment D (1 day of fasting, 7 days of periodic feeding), significantly lower than the other treatments. Furthermore, the highest average value of feed conversion ratio (3.9) was significantly higher compared to other treatments.

Daily Length Growth Rate

The daily length growth rate of saline tilapia fry reared during the study is presented in Figure 3.

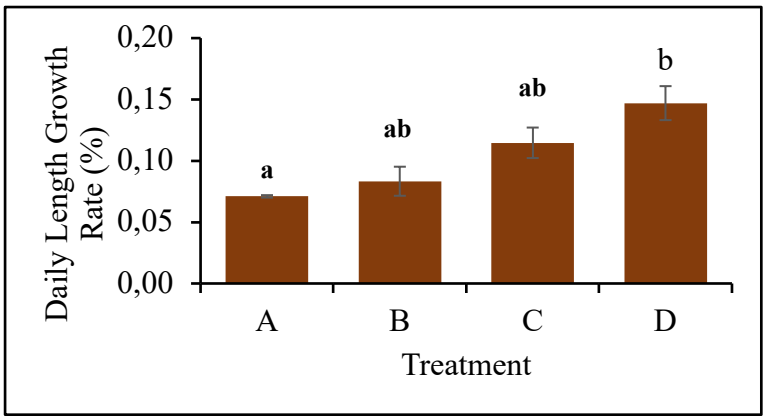

Figure 3. Daily Length Growth Rate of Saline Tilapia Fry that are Periodically Fasted

Based on Figure 3, it shows that periodic fasting has a significant effect (P<0.05) on the daily length growth rate. The lowest average value was obtained in treatment A (control), significantly lower than the other treatments. Furthermore, the highest average value in treatment D (0.15%) was significantly higher compared to other treatments.

DISCUSSION

The results of research on feed efficiency are the percentage increase in body weight with the total feed consumed by saline tilapia fry during rearing. The highest feed utilization efficiency was 0.58% in treatment D (one day fasted and seven days fed). This shows that saline tilapia that are periodically fasted show the ability to utilize feed optimally compared to those without fasting. This condition is thought to be related to the fish's efforts to increase the digestibility of nutrients, especially feed protein. This is closely related to optimizing the use of protein for growth. Feed starvation also causes a decrease in protease activity, but on the other hand, refeeding triggers an increase in protease activity. In addition, periodic food starvation showed an increase in the appetite of saline tilapia during the study. This is due to periodic emptying of the stomach during fasting, then after fasting, daily feed consumption increases. The high appetite of saline tilapia seeds greatly influences the high feed efficiency. The results of this research are in line with the research of Laheng *et al.,* (2020), that periodic food fasting shows higher growth of tilapia fish compared to without fasting. Likewise, Ayuzar *et al.,* (2021), reported that there were differences in the growth performance of milkfish fry including appetite, behavior, daily feed consumption, length growth, feed efficiency, feed conversion ratio during periodic fasting. Furthermore, it was reported that milkfish that were periodically fasted produced significantly better growth performance than those without food fasting.

The effectiveness of linear feed utilization supports an increase in the daily length growth rate and is able to significantly reduce the FCR value. It is suspected that periodic fasting increases the ability of saline tilapia to utilize the nutrients in the feed which are converted into body weight. Ntantali *et al.,* (2023), reported that under fasting conditions, blood plasma triglyceride levels and fish fat tended to increase but on the contrary insulin levels decreased, and different conditions after being fed post-fasting showed increased fat and insulin levels, fat and triglyceride levels actually decreased. This fact is thought to mean that tilapia that are periodically fasted optimally utilize fat reserves in the body for metabolic energy (Villarroe *et al.,* 2011), then during post-fasting when they are fed again, saline tilapia tend to utilize carbohydrates.

The high growth rate after fasting saline tilapia for one day and then being fed for seven days in this study, was also confirmed by Andrilla *et al.,* (2019) that *Chanos chanos* milkfish with one day of fasting for four days on feed experienced compensatory growth, namely growth which is greater than normal conditions, post-fasting. Dawood *et al.,* (2023) reported that tilapia fish that were fasted and fed after one day showed increased growth and better blood performance when compared to those without fasting. Furthermore, it was also reported that the technique of periodic fish fasting is the best strategy for optimizing feed efficiency and is economically a recommendation for increasing the production of *O. niloticus.*

CONCLUSION

Periodic feeding of saline tilapia seeds has a significant effect on feed efficiency, feed conversion ratio and daily length growth rate. The best results were found in the treatment of 1 day of fasting for 7 days of periodic feeding.

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