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THE EFFECT OF DIFFERENCES IN COMMERCIAL FEED DOSES ON ABSOLUTE WEIGHT GROWTH OF SANGKURIANG CATFISH (*Clarias gariepinus* Var.) SIZED 9-12 CM IN EXPERIMENTAL TANKS

Pengaruh Perbedaan Dosis Pakan Komersial Terhadap Pertumbuhan Berat Mutlak Ikan Lele Sangkuriang (*Clarias gariepinus* Var.) Ukuran 9-12 cm di Bak Percobaan

Indah Alfiana*, Muhajir, Indra Wirawan

Aquaculture Study Program, Dr. Soetomo University

Semolowaru Street No. 84, Menur Pumpungan, Sukolilo District, Surabaya City, East Java 60118

*Coresponding author: indahalfiana808@gmail.com

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ABSTRACT

The Sangkuriang catfish (*Clarias gariepinus* var.) has the advantage of adapting quickly to new environments, has a relatively high nutritional content, is technically easier to cultivate, and has a short life cycle, allowing for quicker harvest. Furthermore, this fish offers a very profitable economic prospect. Seeds measuring 9-12 cm can minimize the risk of cultivation failure due to their more stable and uniform growth. In aquaculture, feed plays a vital role because it directly affects the growth rate and health of fish. Commercial feeds have a very complete and balanced nutritional composition. One important element in feeding management is feed dosage. If the feeding is overdosed, it can pollute the aquatic environment and vice versa if the deficiency can cause malnutrition. This study aims to determine the effect of commercial feed doses on the absolute weight growth of sangkuriang catfish measuring 9-12 cm in experimental tanks. This study used an experimental method with a Completely Randomized Design (CRD) consisting of 5 treatments and 5 replications. The treatment in this study was the provision of commercial feed with different doses. Treatment A; dose 3% of the weight of the test animal biomass, treatment B; dose 5% of the weight of the test animal biomass, treatment C; dose 7% of the weight of the test animal biomass, treatment D; dose 9%, of the weight of the test animal biomass and treatment E; dose 11% of the weight of the test animal biomass. The test animals used sangkuriang catfish measuring 9-12 cm with an average weight of 5 g/individual. The stocking density was 1 individual/liter, the experimental media used fresh water with a volume of 7 liters/tank. The results showed that treatment C provided the best results for absolute weight growth of 9-12 cm Sangkuriang catfish, at 8,8 grams per fish. Water quality data showed a water temperature of 27.8-28.8°C, pH of 6.36-6.60, and dissolved oxygen of 5.60-5.75 ppm.

Keywords: 9-12 cm Sangkuriang Catfish, Absolute Weight Growth, Commercial Feed Dosage

ABSTRAK

Lele sangkuriang (*Clarias gariepinus* var.) memiliki keunggulan dapat beradaptasi cepat

terhadap lingkungan yang baru, kandungan gizi cukup tinggi, teknis budidayanya lebih mudah dan siklus hidup yang singkat sehingga dapat dipanen lebih cepat. Selain itu, ikan ini memiliki prosek ekonomi yang sangat menguntungkan. Benih ukuran 9–12 cm dapat memperkecil risiko kegagalan budidaya karena memiliki pertumbuhan lebih stabil dan seragam. Dalam Budidaya, pakan memegang peranan sangat vital karena secara langsung dapat mempengaruhi laju pertumbuhan dan kondisi kesehatan ikan. Pakan komersial memiliki memiliki komposisi nutrisi sangat lengkap dan seimbang. Salah satu unsur penting dalam manajemen pemberian pakan adalah dosis pakan. Penelitian ini bertujuan untuk mengetahui pengaruh dosis pakan komersial terhadap pertumbuhan berat mutlak ikan lele sangkuriang *(Clarias gariepinus* var.*)* ukuran 9-12 cm di bak-bak percobaan. Penelitian ini menggunakan metode eksperimental dengan Rancangan Acak Lengkap (RAL) terdiri 5 perlakuan dan 5 kali ulangan. Perlakuan dalam penelitian ini berupa pemberian pakan komersil dengan dosis yang berbeda. Perlakuan A ; dosis 3% dari berat biomas hewan uji, perlakuan B ; dosis 5% dari berat biomas hewan uji, perlakuan C ; dosis 7% dari berat biomas hewan uji, perlakuan D ; dosis 9%, dari berat biomas hewan uji dan perlakuan E ; dosis 11% dari berat biomas hewan uji. Hewan uji menggunakan ikan lele sangkuriang ukuran 9 –12 cm dengan berat rata – rata 5 g/ekor. Jumlah padat tebar 1 ekor/liter, media percobaan menggunakan air tawar dengan volume 7 liter/bak. Hasil penelitian menunjukkan perlakuan C memberikan hasil terbaik terhadap pertumbuhan berat mutlak ikan lele sangjuriang ukuran 9 – 12 cm sebesar 8,8 gr/ekor. Data kualitas air diperoleh suhu air berkisar 27,8 – 28,8 °C, derajat keasaman berkisar 6,36 – 6,60 dan oksigen terlarut berkisar 5,60 – 5,75 ppm.

Kata Kunci: Lele Sangkuriang Ukuran 9-12 cm, Dosis Pakan Komersial, Pertumbuhan Berat Mutlak

INTRODUCTION

The need for fish-based protein in Indonesia continues to increase every year. KKP data (2023) recorded that national fish consumption increased from 50.69 kg/capita/year in 2019 to 56.48 kg/capita/year in 2022. This increase in consumption was followed by aquaculture production which in 2024 reached 6.37 million tons, an increase of 13.64% compared to the previous year (KKP, 2024). Among the cultivated commodities, catfish is the most dominant with national production in 2023 amounting to 1.14 million tons, much higher than patin at 348 thousand tons, or around 27% of the total cultivated fisheries production excluding seaweed (KKP, 2023). Thus, catfish has become a leading fishery commodity in Indonesia. Laku, M, *et al*. (2024), stated that every year the demand for catfish continues to increase in both domestic and international markets.

Sangkuriang catfish (*Clarias gariepinus* var.) has the advantage of being able to adapt quickly to new environments, has a fairly high nutritional content, and a short life cycle so it can be harvested more quickly. In fish farming, selecting high-quality Sangkuriang catfish fry significantly impacts growth rates. Uniformly sized and large fry are more resistant to stress and disease and utilize feed more efficiently. Aprillia, H, *et al*. (2024) emphasized that 9–12 cm fry can minimize the risk of cultivation failure due to their more stable and uniform growth. Due to these advantages, Sangkuriang catfish are often chosen by farmers due to their easier cultivation techniques and more profitable economic prospects (Anandya, A, *et al*., 2025).

In fish farming, feed plays a vital role because it can directly affect the growth rate and health condition of the fish. According to Wahyudi, MH & Haryaksati (2023), quality feed contains complete and balanced nutrition, including protein, fat, carbohydrates, vitamins, and minerals needed to support growth, body tissue formation, and maintain fish endurance. According to Rahim *et al*. (2022), high-quality feed makes use more efficient. In terms of food preferences, the Sangkuriang catfish is included in the carnivorous group (meat eaters). These

fish, at a size of 9-12 cm, prefer commercial feed compared to natural feed. Commercial feed has the advantage that the size can be adjusted to the size of the fish's mouth opening and the nutritional composition according to the needs of the type and age of the fish (Khairuman, 2003).

One of the crucial elements in feeding management is the dosage factor. Feeding must be done at the right dosage, as both overfeeding and underfeeding can negatively impact fish growth and health. According to Mata *et al*. (2022), underfeeding can make fish susceptible to disease because the nutritional content is insufficient to meet basic metabolic needs, resulting in stunted growth and even death. Conversely, overfeeding can degrade water quality due to the accumulation of unconsumed feed residue, which can lead to a decrease in fish appetite.

METHODS

Time and Place

This research was conducted at PT. Madura Marina Persada in Lombang Village, Batang-Batang District, Sumenep Regency, East Java. The research period was 30 days, from November 1, 2025, to November 30, 2025.

Materials and Equipment

The materials and equipment used in this study included 9-12 cm Sangkuriang catfish with an average weight of 5 g per fish as test animals, freshwater as a rearing medium, detergent for cleaning equipment, commercial feed, and EM4. The research equipment consisted of 25 15-liter gallon jugs as rearing containers, an aerator and its accessories, a fish scoop, a digital scale for measuring biomass, a ruler, a pH meter, a thermometer, a DO meter for measuring dissolved oxygen, writing instruments, a cell phone camera for documentation, and a laptop for data recording. Each container was filled with 7 liters of water, then allowed to settle for 24 hours, aerated, and EM4 added to stabilize the water quality. The test feed used was Hi Pro Vite 781-1.

Method

This study uses an experimental method, this method is the most scientifically reliable (most valid), because it is carried out with strict control of interfering variables outside the experimental ones (Arsyad, N and F. Fatmawati, 2018). The research design used is a Completely Randomized Design (CRD) with five treatments and five replications. The treatment used is in the form of giving different doses of commercial feed to 9-12 cm sangkuriang catfish, namely: (a) 3%, (b) 5%, (c) 7%, (d) 9%, (e) 11%.

Research Procedures

The study began with the preparation and arrangement of the research containers. Each container was then filled with 7 liters of fresh water and EM4 probiotics were added. The animals were then aerated for 24 hours. The test animals were acclimatized and then weighed for their initial weight. Fish were stocked at a density of 7 per container and fed according to their biomass weight for each treatment. Water changes were performed every three days, and water quality was monitored throughout the study. At the conclusion of the study, the final body weight of the fish was measured to determine their absolute weight.

Test Parameters

The parameters observed in this study included absolute weight growth of Sangkuriang catfish as the primary parameter and water quality as a supporting parameter.

Absolute Weight Growth

The absolute weight growth of the fish was measured to determine the effect of different commercial feed doses. Absolute weight growth was calculated using the formula from Effendi, MI, (1997), as follows:

$$Wm = Wt - Wo$$

Where:

- Wm = Absolute weight gain of test animals (g)
- Wt = Average weight of test animals at the end of the study (g)
- Wo = Average weight of test animals at the beginning of the study (g)

Weight measurements are carried out using analytical scales and the measurement results are recorded in grams (g).

Water Quality

Water quality is maintained and monitored to ensure optimal water conditions. According to Manunggal, AR, *et al*. (2018), a good cultivation medium must have a temperature, pH, and dissolved oxygen levels that meet the biological needs of the fish. Furthermore, Junda, MN, *et al*. (2015) argue that water quality management is crucial to ensure fish growth and optimal productivity. Water quality measurements are routinely performed using a thermometer (°C), pH meter, and DO meter (mg/L).

Data Analysis

The research data were analyzed using analysis of variance (one-way ANOVA) to determine the significant effect. The analysis was continued with the Least Significant Difference (LSD) test using IBM SPSS Statistics 24 software (Prayitno, D, 2012).

RESULTS

Based on the results of research on the effect of differences in commercial feed doses on the absolute weight growth of Sangkuriang catfish (*Clarias gariepinus* var) measuring 9-12 cm, different average growth values were obtained in each treatment. The range of values, averages, and standard deviations of absolute weight growth of Sangkuriang catfish measuring 9-12 cm in each treatment are presented in the following table:

Table 1. Range, Mean Value, and Standard Deviation of Absolute Weight Growth of Sangkuriang Catfish Measuring 9-12 cm in Each Treatment

Treatment	Absolute Weight Growth Range of Sangkuriang Catfish (g)	Average (g)	Standard Deviation (SD)
A	2 – 3	2.2	0.20
B	3 – 4	3.0	0.24
C	8 – 9	8.8	0.20
D	5 – 7	6.2	0.37
E	4 – 6	4.8	0.37

Based on table 1 above, it can be explained that treatment C shows the highest average for absolute weight growth of 9-12 cm sangkuriang catfish. Furthermore, treatments D and E sequentially provide an average that starts to decrease in absolute weight growth. While treatments B and A sequentially provide the lowest average decrease in absolute weight growth of 9-12 cm sangkuriang catfish. Figure 1 below presents a graph of the average value of absolute weight growth of 9-12 cm sangkuriang catfish in each treatment.

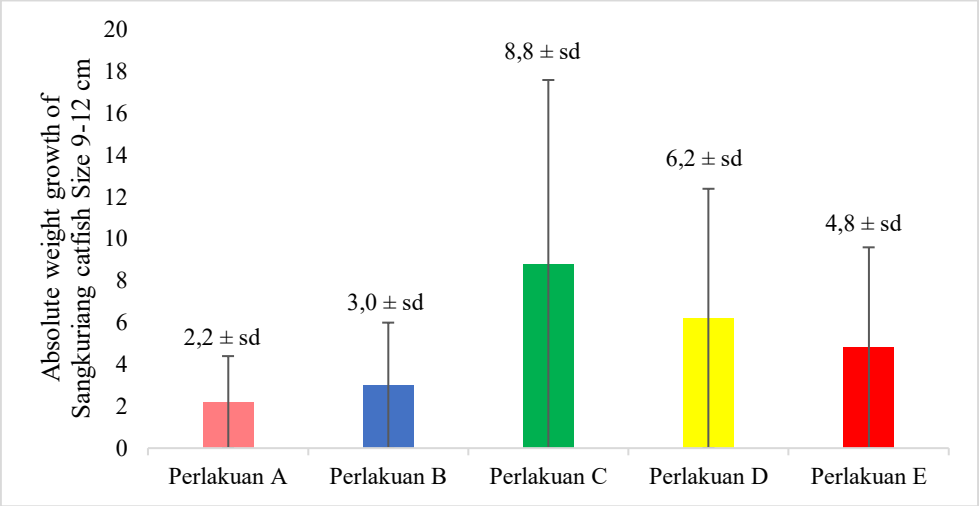

Figure 1. Graph of the Average Absolute Weight Growth of Sangkuriang Catfish Measuring 9 – 12 cm for Each Treatment

To determine whether there were significant differences between treatments, a one-way ANOVA test was conducted, and the results are shown in Table 2.

Table 2. One-Way ANOVA Test of Absolute Weight Growth of Sangkuriang Catfish Measuring 9–12 cm

	Sum of Squares	**Df**	**Mean Square**	**F**	**Sig.**
Between Groups	128.240	4	32.060	76.333	0.000
Within Groups	8.400	20	0.420		
Total	136.640	24			

Based on Table 2 above, it can be seen that the commercial feed dosage significantly affected the absolute length growth of 9-12 cm Sangkuriang catfish (F > Sign). Furthermore, to determine the level of difference between each treatment on the absolute weight growth of 9-12 cm Sangkuriang catfish, a 5% LSD test was conducted. The average and notation of absolute weight growth of 9-12 cm Sangkuriang catfish can be seen in Table 3.

Table 3. Average and Notation of Absolute Weight Growth of 9-12 cm Sangkuriang Catfish

Treatment	**N**	**Subset for alpha = 0,05**				
		1	**2**	**3**	**4**	**5**
A	5	0.2^{a}				
B	5		3.0^{b}			
E	5			4.8^{c}		
D	5				6.2^{d}	
C	5					8.8^{e}

Based on Table 3 above, it can be seen that treatment A was significantly different from treatments B, E, D, and C. Furthermore, treatment B was significantly different from treatments E, D, and C. Meanwhile, treatment E was significantly different from treatments D and C, and likewise, treatment D was significantly different from treatment C.

Water Quality

Water Temperature

The water temperature during the study ranged from 27.8 to 28.8°C. The temperature range, average, and standard deviation for each treatment can be seen in Table 4 below.

Table 4. Temperature Range, Average, and Standard Deviation for Each Treatment

Treatment	Temperature	Average	Standard Deviation (SD)
A	28.3 – 28.7	28.54	0.06
B	28.2 – 28.6	28.44	0.08
C	27.8 – 28.7	28.38	0.15
D	27.8 – 28.7	28.32	0.15
E	28.1 – 28.8	28.44	0.12

Based on Table 4 above, it can be seen that the average temperature for each treatment showed relatively similar figures. To determine whether there were significant differences between the temperatures in each treatment, a one-way ANOVA test was conducted, the results of which are shown in Table 5 below.

Table 5. One-way ANOVA for Temperature

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	0.146	4	0.037	0.492	0.742
Within Groups	1.488	20	0.074		
Total	1.634	24			

Based on Table 5 above, it can be seen that the temperature in each treatment had no significant effect on the absolute weight growth of 9-12 cm Sangkuriang catfish (F < Sign.).

Acidity (pH)

The acidity level (pH) during the study ranged from 6.36 to 6.60. The range, average, and standard deviation of the acidity level for each treatment can be seen in Table 6 below.

Table 6. Range, Average, and Standard Deviation of the Acidity Level for Each Treatment

Treatment	pH	Mean	Standard Deviation (SD)
A	6.40 – 6.60	6.50	0.03
B	6.38 – 6.55	6.46	0.02
C	6.36 – 6.52	6.44	0.02
D	6.39 – 6.57	6.47	0.03
E	6.41 – 6.58	6.49	0.03

Based on Table 6 above, it can be seen that the average acidity levels for each treatment showed relatively similar figures. To determine whether there were significant differences between the acidity levels for each treatment, a one-way ANOVA test was conducted, and the results are shown in Table 7 below.

Table 7. One-way ANOVA Test for Acidity

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	0.010	4	0.003	0.529	0.715
Within Groups	0.098	20	0.005		
Total	0.108	24			

Based on Table 7 above, it can be seen that the acidity level in each treatment had no significant effect on the absolute weight growth of 9-12 cm Sangkuriang catfish (F < Sign.).

Dissolved Oxygen (DO)

Dissolved oxygen levels during the study ranged from 5.60 to 5.75 ppm. The range, average, and standard deviation of dissolved oxygen levels for each treatment are shown in Table 8 below.

Table 8. Range, Average, and Standard Deviation of Dissolved Oxygen Levels for Each Treatment

Treatment	Dissolved Oxygen (ppm)	Mean	Standard Deviation (SD)
A	5.60 – 5.71	5.660	0.44
B	5.60 – 5.71	5.660	0.44
C	5.61 – 5.75	5.668	0.52
D	5.61 – 5.75	5.668	0.52
E	5.63 – 5.70	5.664	0.41

Based on Table 8 above, it can be seen that the average dissolved oxygen levels in each treatment showed relatively similar figures. To determine whether there were significant differences between the dissolved oxygen levels in each treatment, a one-way ANOVA test was conducted, and the results are shown in Table 9 below.

Table 9. One-Way ANOVA Test for Dissolved Oxygen

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	0.000	4	0.000	0.022	0.999
Within Groups	0.041	20	0.002		
Total	0.041	24			

Based on Table 9. above, it can be explained that dissolved oxygen in each treatment did not have a significant effect on the absolute weight growth of Sangkuriang catfish measuring 9-12 cm (F < Sign.).

DISCUSSION

The results of this study on the effect of commercial feed dosage on the absolute weight growth of 9-12 cm Sangkuriang catfish (*Clarias gariepinus* var.) in experimental tanks yielded the following data: treatment A: 2.2 g/fish, treatment B: 3.0 g/fish, treatment C: 8.8 g/fish, treatment D: 6.2 g/fish, and treatment E: 4.8 g/fish. Based on a one-way ANOVA, it can be seen that the commercial feed dosage significantly affected the absolute weight growth of 9-12 cm Sangkuriang catfish. Furthermore, a 5% LSD test showed that treatment C provided the best results for absolute weight growth of 9-12 cm Sangkuriang catfish, at 8.8 g/fish.

Compared to treatments D, E, B, and A, treatment C provided the highest average absolute weight growth in Sangkuriang catfish measuring 9–12 cm. The feeding dose in treatment C was the most appropriate dose to the physiological needs of the test animals in supporting the growth process. The amount of feed provided was balanced with the capacity of the test animals' digestive systems, so that nutrients could be optimally digested and absorbed without causing a metabolic burden. Digestive enzyme activity is influenced by the balance between the amount of feed provided and the ability of the digestive organs to produce endogenous enzymes such as protease, amylase, and lipase. These enzymes play an important role in breaking down proteins, carbohydrates, and fats into simple molecules that are easily absorbed for metabolic processes and body tissue formation. According to Santos, WM, *et al*.

(2020), if the protein content in commercial feed meets the needs of fish, it can increase the activity of digestive enzymes, especially protease, amylase, and lipase. The function of these enzymes can increase the efficiency of feed nutrient utilization and improve growth performance. Digested nutrients are then transported to the liver via the hepatic portal vein to be metabolized into energy and anabolic compounds used in the formation of new tissue and repair of body cells (Rust, MB., 2002). Hanief, MAR, *et al*. (2014), argue that providing feed with the right dosage can provide optimal results for growth, increase feed utilization efficiency and maintain water quality.

Compared to treatment C, treatments D and E sequentially showed a decreasing average for the absolute weight growth of 9-12 cm Sangkuriang catfish. The dosage of commercial feed in treatments C and D exceeded the physiological needs of the test animals, known as an overdose. Excessive feed causes intestinal pressure and damage, disrupting nutrient absorption and inhibiting the growth of test animals. According to Dawood, MA, (2021), excessive feeding can cause significant pressure on the intestines and cause oxidative damage. This condition can increase the risk of chronic enteritis and impaired nutrient absorption over time, thereby reducing the growth rate of fish. Landgraf, K, *et.al*. (2017), added that excessive feeding over a long period of time can cause metabolic disorders, including hepatic steatosis. Excess feed does not provide benefits for growth; instead, it can cause metabolic imbalances that impact the physiological performance of test animals. In addition, the provision of commercial feed in treatments D and E that was not consumed by the test animals was seen to settle at the bottom of the research container in increasing amounts and mixed with feces, as a result of these two organic materials the water as a research medium has the potential to be contaminated so that its quality is threatened to decrease and is toxic. This condition causes the test animals to experience stress and their appetite is reduced and their growth rate is increasingly hampered. Raksono, B, *et al*. (2012), argue that efforts to maintain water quality play a very important role in determining the survival rate and growth of cultivated aquatic organisms.

Compared to treatments C, D, and E, treatments B and A sequentially provided the lowest average decrease in absolute weight growth of 9-12 cm Sangkuriang catfish. The dosage of commercial feed in treatments B and A resulted in the test animals experiencing increasing nutritional deficiencies, known as malnutrition. The nutrition obtained by the test animals was only sufficient to maintain basic physiological functions (*energy maintenance*), such as respiration, circulation, and movement, not for tissue formation. Malnutrition in fish results in decreased immunity, potential for infection with various diseases, and can inhibit growth (Karimah, U, *et al*., 2018). According to Dejo, OF, *et al*. (2022), providing feed below metabolic needs causes decreased growth efficiency due to energy deficits, this is because the process of protein synthesis and muscle tissue deposition does not run optimally. In addition, feeding with low doses causes fish to gather at the water surface and compete to get more food, where this behavioral pattern results in physiological stress (Janzen, WJ, *et.al*., 2012 in Duan, S, *et.al*., 2025).

CONCLUSION

Based on the results of the study on the effect of commercial feed dosage on the absolute weight growth of 9-12 cm Sangkuriang catfish (*Clarias gariepinus* var.) in experimental tanks, it was concluded that: (a) Commercial feed dosage significantly affected the absolute weight growth of 9-12 cm Sangkuriang catfish, with treatment C yielding the best results at 8.8 g/fish. (b) Water quality data showed that the water temperature ranged from 27.8 to 28.8^{o}C, the acidity level ranged from 6.36 to 6.60, and the dissolved oxygen content ranged from 5.60 to 5.75 ppm. These three water quality parameters remained homogeneous and therefore did not affect the absolute weight growth of 9-12 cm Sangkuriang catfish.

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