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Effect Of Different Feeding Percentages Of Golden Snail Paste On Growth And Survival Of Pearl Catfish (Clarias Gariepinus) Larvae

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ABSTRACT

Feed is a primary factor influencing the growth and survival of pearl catfish larvae, therefore innovation in alternative feed that is efficient and highly nutritious is required. This study aims to analyze the effect of feeding paste made from golden snail flour (Pomacea canaliculata) at different percentages on the growth and survival of African catfish larvae (Clarias gariepinus). The method used was an experimental design with a Completely Randomized Design (CRD), consisting of three feeding treatments (5%, 10%, and 15% of biomass weight) with five replications, conducted over a 30-day rearing period. The observed parameters included survival rate (SR), absolute weight growth, absolute length growth, average daily growth (ADG), specific growth rate (SGR), and water quality. Data were analyzed using Analysis of Variance (ANOVA), followed by the Least Significant Difference (LSD) test at a 5% significance level. The results showed that different feeding percentages had a highly significant effect ($p > 0.05$) on all parameters. The best treatment was obtained at a feeding rate of 10% of biomass weight, with a survival rate of 96.4%, absolute weight gain of 24.6 g, absolute length gain of 4.56 cm, ADG of 0.41 g/day, and SGR of 70%. Water quality during the study remained within optimal ranges, with temperatures of 24–27°C and pH levels of 7.8–8.5. Thus, feeding paste made from golden apple snail flour at 10% of biomass weight is the optimal dosage to improve the growth and survival of pearl catfish larvae.

INTRODUCTION

Pearl catfish *(Clarias gariepinus)* is one of the important commodities in Indonesia's food security due to its high production levels and widespread cultivation by farmers. Compared to local catfish *(Clarias batrachus)*, pearl catfish exhibits faster growth and better disease resistance, making it more profitable for aquaculture activities (Nurhidayat, 2021). Meanwhile, local catfish is rarely cultivated because it is less profitable, particularly due to its relatively very slow growth (Yuningrum & Sahayati, 2021). However, the success of aquaculture is not solely determined by the fish species but by the success at the hatchery stage as a crucial initial phase in production. One of the main challenges at this stage is feed utilization efficiency. Feed also represents the largest component (50-70%) of production costs and greatly influences growth as well as survival rates (Yanuar, 2020).

So far, much research has still focused on the use of conventional commercial feeds, thusmore economical alternative feeds that have not yet been optimally utilized (Sinaga et al., n.d.). A potential innovation to develop is pasta-shaped feed, which is feed formulated from various raw materials with nutritional content suited to the needs of fish larvae (Hertika et al.,

2024). One readily available ingredient to reduce the use of fish meal is golden snail meal. The golden snail *(Pomacea canaliculata)* is one of the easily obtainable alternative feed ingredients with a protein content ranging from 51-57%, while the protein requirement for fish growth is around 40-60% (Yuda et al., 2023). Nevertheless, the utilization of golden snail meal as a fish meal substitute in pasta-shaped feed formulations for the growth and survival rates of pearl catfish larvae has rarely been studied previously.

Based on the above, there is a research gap in the form of no specific studies on the effect of using golden snail meal in pasta-shaped feed, and the appropriate percentage level to enhance the growth and survival rate of pearl catfish larvae remains unknown. Therefore, the objective of this research is to determine the extent to which pasta feed using golden snail meal can serve as a solution to improve the growth and survival rate of pearl catfish larvae.

METHOD

The method applied in this study is an experimental method. This study used a Complete Random Design (CRD) with three treatments of feeding golden snail paste with prescriptions (5%, 10%, and 15%) of biomass weight, and repeated five times in each treatment.

Time and Place

This research was carried out for one month in March 2025. The location of this research is located at the freshwater fisheries agribusiness laboratory, SMK Negeri 1 Glagah Banyuwangi on Kuntulan No.1 Street, Watu Ulo Hamlet, Rejosari, Glagah District, Banyuwangi Regency, East Java.

Tools and Materials

The tools that will be used in this study include: basins, trays, blenders, flour sieves, knives, plastic bags, aquariums, water hoses, aerator hoses, aeration stones, aerators, fine nets, analytical digital scales, rulers, pH meters, and thermometers. The materials that will be used in this study include: 10-day-old pearl catfish larvae, freshwater, snail flour, tapioca flour, and em 4 fisheries.

Making Golden Conch Flour

The golden snail used for the research comes from a rice field located in the city of Banyuwangi in a still living state, after which the golden snail is separated from the meat and shell, then the meat that has been separated from the shell is then cleaned or washed using clean water, this process is carried out with the aim of removing the remaining dirt and mucus. The next step is to cut into small pieces first to speed up the drying process, after which dry under the heat of the sun for approximately 3 days. This drying aims to reduce the moisture content so that the meat of the golden snail becomes more durable. Furthermore, dried snail meat is refined using a blender and then sifted until it becomes flour, after which golden snail flour can be used as the main ingredient in making feed.

Formulation of Raw Material Requirements

To obtain test feed with a protein content of 45%, the easiest method used in calculating the raw material requirements formulation is the Square Method (Manik & Arleston, 2021). The Square Method is a feed formulation calculation used to mix two or more types of feed containing certain nutrients at different concentrations to achieve the desired concentration (Elvince, 2024). The formulation of test fish feed requirements using the specified raw materials (golden snail flour, tapioca flour, and EM4 for fisheries) is as follows:

Table 1. Raw Material Requirements Formulation Table

No	Types of raw materials	Material parts (%)	Protein needs (%)	Number of raw materials required (gr)
1	Golden Snail Flour	56,06%	80,2%	802 grams

No	Types of raw materials	Material parts (%)	Protein needs (%)	Number of raw materials required (gr)
2	Tapioca flour	0,41%	19,8%	198 grams

Preparation of Catfish Larvae

The larvae of pearl catfish are obtained from artificial spawning. Artificial spawning of pearl catfish is a spawning process assisted by humans. This artificial spawning aims to simplify the research process. The pearl catfish larvae used in this study are seeds that are 10 days old from egg hatching. The stocking density used in this study was 50 fish weighing 1.62 grams and a length per fish of 1.5 cm.

Aquarium Preparation

The initial preparation that must be done in this study is to prepare an aquarium with a length of 60 cm, a width of 30 cm, a height of 40 cm. Before using the aquarium, make sure the aquarium has been cleaned using clean water. After cleaning it thoroughly and ensuring that the aquarium condition is sterile and dry.

Media Preparation

The preparation of media for this research activity uses clean water, the use of water as a medium is obtained from drilled wells with a certain depth until a water source is obtained. The water from the borewell is clean water but has a low oxygen content. Before the media is used, it is necessary to aerate the media for 24 hours, and the water level used is 25 cm.

Pasta Feed Manufacturing

How to make pasta feed is as follows: Prepare a basin first as a pasta feed container, pour 802 grams of golden snail flour and pour 198 grams of tapioca flour then stir until evenly distributed, After that 15ml of fisheries EM4 is added and dissolved using 100 ml of water and then poured into the dough (Sadikin, 2021). After that, stir until smooth. Feed in the form of paste is ready to be given to test fish that have previously been proximate analysis tests.

Feeding Pasta to Catfish Larvae

Feeding pasta feed to catfish larvae begins by first kneading it into small portions. Then it is given to the angle of the aquarium that has been determined in the research. The frequency of feeding is 4 times a day, namely in the morning at 08.00 WIB, during the day at 12.00 WIB, in the afternoon at 16.00 WIB, and at night at 20.00 WIB.

PARAMETERS OF RESEARCH OBSERVATION

a. Survival Rate

Survival Rate is the percentage of the number of fish alive and the number of fish at the end of the study (Effendi, 1997) in (Putri, 2014) The formula for calculating Survival Rate (SR):

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

Information:
SR = Survival
Nt = Number of fish alive at the end of the study
No = The number of fish alive at the start of the study

b. Absolute Weight Growth

Absolute weight is the difference between wet weight at the end of the study and the wet weight at the beginning of the study during the fish rearing time (Huda et al., 2023). The calculation of absolute weights according to (Santikawati et al., 2024):

$$W = Wt - Wo$$

Information:
W = Absolute weight growth (g)

Wt = Fish weight at the end of the study (g)
Wo = Fish weight at the beginning of the study (g)

c. Absolute Length Growth

The growth of fish body length is influenced by the genetics of each individual and the protein intake to support the growth obtained from feed. According to(Santikawati et al., 2024), Long growth is defined as the percentage of growth at each time interval which is formulated as follows:

$$L = Lt - Lo$$

Information:
L = Absolute length growth (cm)
Lt = Total length of fish at the end time(cm)
Lo = Total length of fish at the beginning (cm)

d. Daily Growth Rate

The daily growth rate can use the following formula (Tasyah et al., 2019):

$$ADG = \frac{Wt - Wo}{t}$$

Information:
ADG = Average daily growth
Wt = Final body weight (g)
Wo = Initial body weight (g)
t = Length of time of research (hari)

e. Specific Growth Rate

Specific growth rate (SGR) can be calculated using the formula ((Effendie,1997 in the (Gunawan et al., 2019)) that is:

$$SGR = \frac{\text{In Wt} - \text{In Wo}}{\text{t}} \times 100\%$$

Information:
SGR = Specific growth rate
Wt = Average weight of fish at the end of the experiment
Wo = Average weight of fish at the beginning of the experiment
T = Length of time (days)

f. Water Quality Parameters

Water quality observation in this study is very important. The two main parameters used in this study include temperature and pH checking. Temperature measurements can be made using a thermometer. Meanwhile, pH measurement uses a pH meter. Measurements will be taken every morning, at 07.00 WIB, and in the afternoon at 16.00 WIB.

DATA ANALYSIS

The data obtained from the research results of administering golden snail pasta feed include calculations of Absolute Weight Gain, Absolute Length Gain, Specific Growth Rate (SGR), Average Daily Gain (ADG), and Survival Rate (SR), followed by statistical tests in the form of Analysis of Variance (ANOVA) to determine the effect on each treatment. If differences are found among treatments, it is continued with the Least Significant Difference test (LSD 5%).

RESULT AND DISCUSSION

a. Survival Rate

The results of the study on the survival rate of pearl catfish larvae *(Clarias gariepinus)* against the feeding of golden snail paste with a different percentage in each treatment. Data on the survival rate of pearl catfish larvae in each treatment can be seen in figure 1.

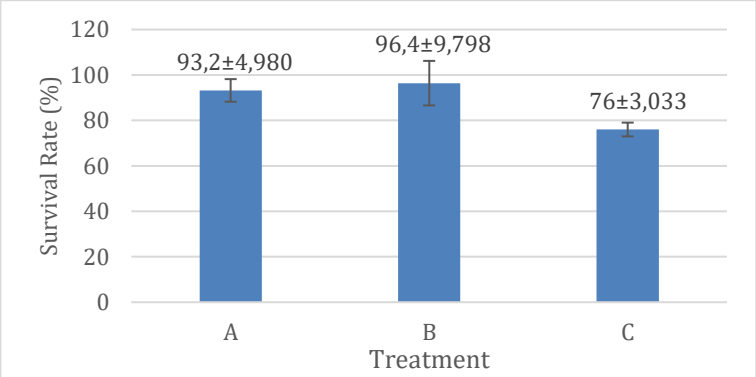

Figure 1. Data on the Survival Rate of Pearl Fish Larvae *(Clarias gariepinus)*

Based on the calculations performed, the Survival Rate (SR) over 30 days of rearing for treatments with pasta feed at different percentages on pearl catfish larvae showed varying results. The survival rate of pearl catfish larvae fed pasta feed with golden snail meal at different percentages was (93.2%) for treatment A, (96.4%) for treatment B, and (76%) for treatment C. The ANOVA test results showed that the calculated F value (13.89) was greater than the critical value (3.88), so it can be concluded that the three treatments of golden snail pasta feed had a highly significant difference on the Survival Rate (SR) parameter of pearl catfish larvae. Additionally, the Least Significant Difference test (LSD 5%) results indicated that all three treatments were significantly different from each other, suggesting that each feed percentage level elicited a different biological response in pearl catfish larvae. He survival rate in treatment B, with 10% golden snail pasta feed, was higher compared to treatment C with 15% feed, which instead showed a quite significant decline.

This indicates that increasing the amount of feed does not always proportionally increase the survival rate. rather, there is an optimal limit in feed utilization by pearl catfish larvae. At certain levels, feed can be efficiently utilized to support growth and survival rates, while uneaten feed will lead to a decline in water quality. This aligns with the opinion (Haryasakti & Wahyudi, 2024) that providing feed in the appropriate amount can maximize feed utilization while reducing water quality pollution. Conversely, excessive feeding, as in treatment C at 15%, worsens the rearing environment conditions and lowers the survival rate. As explained by (Sudaryono, 2018) in (Indra et al., 2021) excessive feed administration will increase production costs from an economic perspective, and from an environmental perspective, it will degrade water quality due to leftover uneaten feed.

b. Absolute Weight Growth

The results of the observation of absolute weight growth for 30 days. The absolute weight growth graph can be seen in Figure 2:

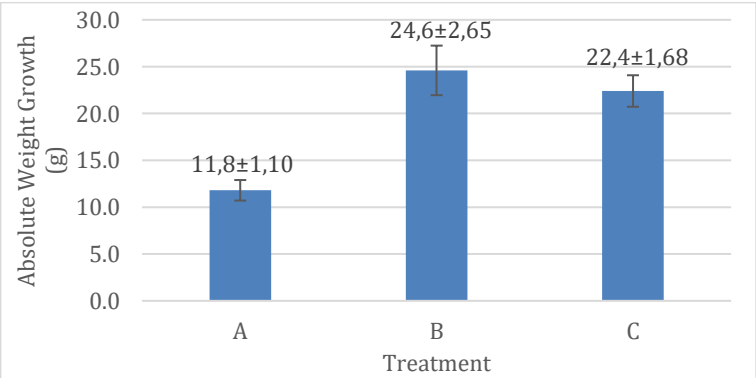

Figure 2. Growth of Absolute Weight of Pearl Catfish Larvae *(Clarias gariepinus)*

Based on the calculations performed, the average Absolute Weight Gain for pearl catfish larvae *(Clarias gariepinus)* ranged from 11.8 to 24.6 grams. The ANOVA test results showed that the calculated F value (63.78) was greater than the critical value (3.88), so it can be concluded that administering golden snail pasta feed at different percentages had a highly significant difference on the Absolute Weight Gain of pearl catfish larvae. Additionally, the Least Significant Difference test (LSD 5%) results indicated that all three treatments were significantly different from each other. Each treatment showed different growth results, with treatment B providing the best growth compared to treatments A and C. These results indicate that administering feed at 10% of biomass weight with a frequency of 4 times per day represents the optimal condition for supporting absolute weight gain in pearl catfish larvae. Compared to treatment A at 5%, the higher feed amount in treatment B better met the energy and nutritional needs for growth, resulting in greater absolute weight gain. This is consistent with the findings of (Faruq et al., 2019) A feeding frequency of 4 times per day with the appropriate feed amount can better stimulate absolute weight gain in fish. This is consistent with previous research (Lazuardi and Sudarto, 2014) in (Sadikin, 2021) on pearl catfish larvae *(Clarias gariepinus),* where absolute weight gain increases with feed administration at 10% of biomass weight. However, increasing the feed amount does not always yield maximum results, as seen in treatment C. This indicates that differences in feeding rates directly contribute to absolute weight gain in pearl catfish larvae. Thus, feed utilization efficiency becomes a key factor in determining growth success. As explained by (Karimah et al., 2018), providing feed in the appropriate amount is essential for achieving successful growth.

c. Absolute Length Growth

Observation results Growth absolute length for 30 days. The absolute length growth graph can be seen in Figure 3:

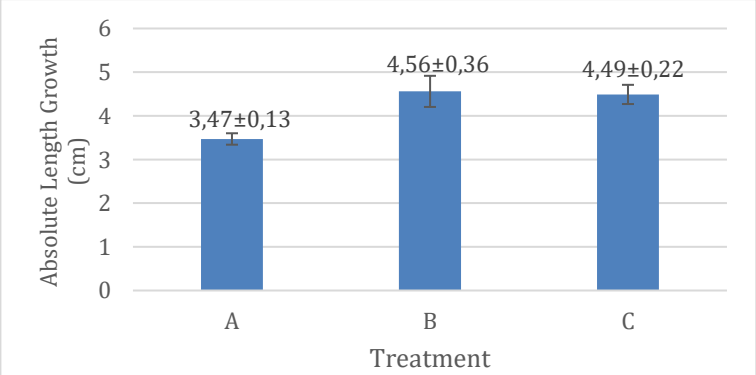

Figure 3. Absolute Growth Length of Pearl Catfish Larvae *(Clarias gariepinus)*

The research results showed that different percentages of pasta feed had a significant effect on the absolute length growth of pearl catfish larvae *(Clarias gariepinus)*, with a range of 1.97–3.06 cm. The ANOVA test results showed that the calculated F value (28.83) was greater than the critical value (3.88), indicating a highly significant difference among treatments, which was further confirmed by the Least Significant Difference test (LSD 5%), where all treatments were significantly different from each other. However, the research results show that treatment B, with 10% feed and a feeding frequency of four times a day, produced the best absolute length growth; this still needs further analysis, especially regarding whether feeding frequency or feed percentage had a more dominant influence on the result. In addition, the statement that treatment A with 5% feed was too low and treatment C with 15% feed was too high remains only an assumption if it is not supported by data on feed efficiency, survival rate, and water quality during the study. Excessive feeding in treatment C may reduce water quality, so environmental factors should remain properly controlled. As explained by (Rusindiyanto et al., 2024), the amount and frequency of feed must be carefully considered so that fish growth is

optimal and the environment remains maintained. On the other hand, the low growth in treatment A was caused by limited energy for metabolism and growth; however, it still needs to be examined whether the larvae experienced feed competition or other stress factors. Thus, although the results of this study are in line with the opinion of (Wibowo & Didik, 2025) that insufficient feed or feed that does not meet the fish's needs will inhibit growth, excessive feeding will also inhibit growth.

d. Daily growth rate

The results of observations during the study on the average daily growth of pearl catfish larvae *(Clarias gariepinus)* fed golden snail paste with different percentages can be seen in figure 4.

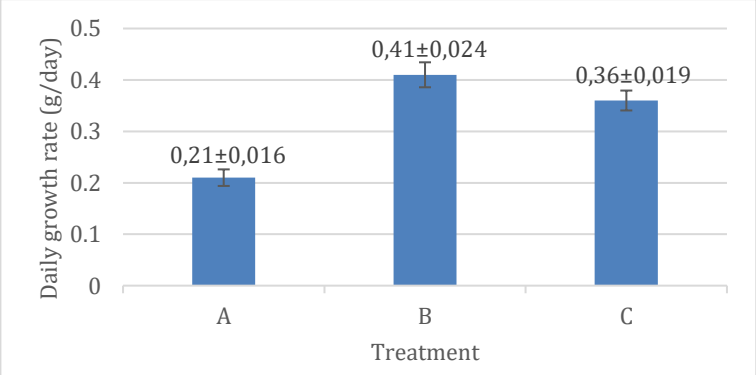

Figure 4. Daily Growth Rate of Pearl Catfish Larvae *(Clarias gariepinus)*

Based on the research results, the average daily growth rate of pearl catfish larvae over 30 days showed significant differences among treatments, namely: treatment A at 0.21 g, treatment B at 0.41 g, and treatment C at 0.35 g. The ANOVA test results showed that the calculated F value (130.77) was greater than 3.88, confirming a highly significant effect of differences in feed percentage on the daily growth rate, which was reinforced by the Least Significant Difference test (LSD 5%), where all treatments were significantly different. Although treatment B with a 10% feed percentage produced the best growth, this result should be interpreted more critically by considering other factors besides feed amount, such as feed utilization efficiency, water quality, and the possible accumulation of leftover feed in treatment C. As explained by (Hadijah et al., 2024), excessive feeding will inhibit growth. Meanwhile, treatment A with 5% pasta feed can be explained by limited nutrient intake, but it cannot yet be confirmed whether this was caused solely by the amount of feed or also influenced by physiological conditions. As explained by (Hanief et al., 2014) dalam (Cahyani & Hafiludin, 2022), insufficient feeding can cause fish growth to be suboptimal because it does not meet the fish's nutritional needs.

e. Specific Growth Rate

The results of the observation of the Specific Growth Rate (SGR) of pearl catfish larvae fed golden snail paste for 30 days. The Specific Growth Rate (SGR) graph can be seen in figure 5.

The research results showed that administering golden snail pasta feed at different percentages had a significant effect on the specific growth rate of pearl catfish larvae (*Clarias gariepinus*), with values ranging from 5.3% to 7.2%. The ANOVA test results showed that the calculated F value (143.65) was greater than 3.88, indicating a highly significant difference among treatments, which was reinforced by the Least Significant Difference test (LSD 5%), where all treatments were significantly different. Treatment B, with 10% pasta feed, produced the highest specific growth rate, at 7.2%. As explained by (Prakoso & Kurniawan, 2022), proper feed provision and sufficient nutritional needs will produce optimal fish growth. The low growth rate in treatment A with a 5% feed percentage can indeed be associated with insufficient nutrient intake, but other factors such as larval competition and adaptation to the feed may also

have influenced the result. As explained by (Djamil et al., 2023) insufficient feeding and competition among pearl catfish larvae will hinder their growth. In addition, the decline in specific growth rate in treatment C with a 15% feed percentage shows that increasing the amount of feed is not always linearly related to increased growth; in fact, it can cause negative effects due to uneaten feed that is not utilized. The accumulation of leftover feed can reduce water quality by increasing ammonia, which in turn may inhibit the growth of pearl catfish larvae. As explained by (Sularno et al., 2023), feed given to catfish in excessive amounts and not consumed can become toxic as the feed breaks down in the water into ammonia.

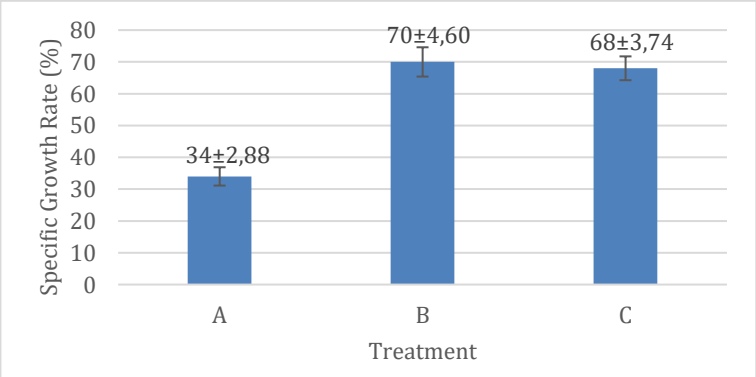

Figure 5. Specific Growth Rate (SGR) of Catfish Larvae *(Clarias gariepinus)*

f. Water Quality

During the study, water quality measurements such as temperature and pH were carried out. This is done because water is a very important medium to increase the appetite of fish, so that it is stable and not stressed. These changes in water quality can also lead to death in fish. The results of water quality measurement can be seen in Table 2, as follows:

Table 2. Table of Temperature and pH Measurement Results

Treatment	Water Quality Parameters	
	Temperature (°C)	pH
A	24 – 27	7,8 – 8,2
B	24 – 27	8,0 – 8,4
C	24 – 27	8,1 – 8,5

The water quality measurements taken from the beginning to the end of the study for each treatment still remained within the recommended range, or in conditions suitable as a rearing medium for pearl catfish larvae. Based on the water quality measurement table, the temperature during the study was relatively stable, ranging from 24°C to 27°C. This is consistent with (Widodo et al., 2023), who stated that a good water temperature for catfish growth ranges from 20°C to 30°C, with an optimal temperature of 27°C. This shows that an optimal water temperature range affects the survival of pearl catfish larvae. Meanwhile, the water pH in this study ranged from 7.8 to 8.5. For pearl catfish larvae, this still indicates normal values and is able to support their survival. As explained by (Fitriana & Mufida, 2024), catfish grow optimally at a pH range of 6.5 to 8.5, under which physiological conditions and the immune system function properly.

CONCLUSION

The percentage of pasta feed using golden snail meal affects the growth and survival of pearl catfish larvae, with a 10% pasta feed dose based on biomass weight producing the best results. The best values obtained for the survival rate parameter were 96.4%, absolute weight gain was 24.6 grams, absolute length gain was 4.56 cm, daily growth rate was 0.41 grams/day,

and specific growth rate was 70%. The ANOVA results from the three treatments fed pasta feed with different percentages showed a very significant difference because the calculated F value was greater than the table F value for each observed parameter. This was also supported by the Least Significant Difference test (LSD 5%), which showed that all three treatments were significantly different from each other. Meanwhile, for the water quality parameters, the values during the study, such as temperature, ranged from 24°C to 27°C, while the water pH ranged from 7.8 to 8.5. Therefore, these conditions were able to support the survival of pearl catfish larvae.

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