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THE EFFECT OF DIFFERENT WATER LEVELS ON THE GROWTH AND SURVIVAL RATE OF CACHAMA (*Colossoma macropomum*) LARVAE

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ABSTRACT

The study was conducted from March to May 2022 at the Fish Hatchery and Breeding Laboratory of the Fishery and Marine Science Faculty, Universitas Riau. This research aimed to determine the effect of the best water level on the growth and survival rate of cachama larvae (*Colossoma macropomum*). This study used a factorial completely randomized design (CRD) with four treatments and three replications. The treatments used were P1 = water level 5cm, P2 = water level 10cm, P3 = water level 15cm, and P4 = water level 20cm. Larvae were reared for 40 days with a stocking density of 2 fish/L. Different water levels showed a significant effect on the growth of absolute weight, absolute length, and specific growth rate of cachama larvae and no effect on the survival of cachama larvae ($p<0.05$). The best treatment was at a water level of 5 cm, with absolute growth of 1.73 g, absolute length of 4.59 cm, specific growth rate (SGR) of 17.16%/day, and survival rate of 91.11%. Water quality parameters during the study were temperature ranging from 26.7-28.4℃, pH 6.0-6.9, and dissolved oxygen ranging from 5.2-5.9 mg/L.

Keywords: Water Level, Cachama, Growth, Survival Rate

1. INTRODUCTION

Cachama (*Colossoma macropomum*) is a fishery commodity with high economic value. Initially, freshwater pomfret was traded as ornamental fish, but because it grows relatively quickly and tastes good, people used it as food fish[1]. Cachama has several advantages as a cultured organism; it is relatively resistant to disease, has a high appetite, has fast growth, and is not too difficult to cultivate[2].

High market demand results in high cultivation production requirements. Fish farming activities are greatly influenced by the availability of superior seeds both in quality and quantity. So, it is necessary to find out how to increase the growth of this fish more optimally than the current normal conditions. Much research on fish has been carried out to increase growth through hormones and feed, but only some studies have studied environmental approaches[3].

Cachama tend to swim in water bodies[4], so cachama need energy to swim to the surface and bottom of the container to get oxygen and food. Research by Nursihan et al.[5] shows that rearing snakehead fish seeds at a height of 3 cm gives the best results, with a survival of 91.7%, while a height of 5 cm provides specific weight and length growth for snakehead fish seeds of 0.53 g and 0.62%. Then, the research results of Suparta et al.[6] explained that rearing eels with a height of 15 cm resulted in an absolute growth value of 25.67 g and a specific rate of 0.08%/day.

The research results of Haris et al.[7] stated that the average growth in weight and length of the best goldfish at the height of 10 cm was 0.77 g and 1.12 cm, with survival of 96.67%. Furthermore, Estrada et

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al.[8] explained that a water level of 5 cm when rearing snakehead provided survival results of 96%, while at a water level of 10 cm, length growth resulted in 2.55 cm.

The research results of Susanto et al.[9] stated that rearing Asian redtail catfish with a height of 15 cm resulted in an absolute weight growth value of 0.32g, an average absolute length growth of 1.79 cm, and a survival rate of 64.75%. It was further explained that a water surface height of 15 cm makes it easier for Asian redtail catfish larvae to take in oxygen and food. Based on the problems above, it is necessary to research the effect of different water levels on the growth and survival of cachama larvae. This research aims to determine the effect of different water levels on growth rates and survival of larvae cachama and to obtain the best water level for growth and survival post-larvae cachama.

2. RESEARCH METHOD

Time and Place

This research was conducted for 40 days from April to May 2022 at the Fish Hatchery and Breeding Laboratory (PPI) Faculty of Fisheries and Marine, Universitas Riau.

Method

The method used in this research was an experimental method with a completely randomized design (CRD) with four treatment levels and three replications, resulting in 12 experimental units. The treatment in this study was based on a study by Harahap et al.[10] on Asian redtail catfish larvae with the best water height of 5 cm. So, the treatment used in this research is as follows:

P1 : Rearing cachama larvae at a water level of 5 cm (50 cm x 60cm x5 cm) with a water volume of 15 L

P2 : Rearing cachama larvae at a water level of 10 cm (50 cm x 30cm x 10cm) with a water volume of 15 L

P3 : Rearing cachama larvae at a water level of 15 cm (30 cm x 33cm x 15cm) with a water volume of 15 L

P4 : Rearing cachama larvae at a water level of 20 cm (25cm x 30cm x 20cm) with a water volume of 15 L

Procedure

Media and Container Preparation

The water used for research comes from drilled wells in the Fish Hatchery and Breeding Laboratory, Faculty of Fisheries and Marine, Universitas Riau. The water from the drilled well is first deposited in a tank for three days to settle the existing dirt and metal particles. Meanwhile, the container used in rearing larvae is an aquarium measuring 50x60x20 cm, three units for treatment P1 (water height 5cm), measuring 30x50x20 cm, three units for treatment P2 (height 10cm), measuring 30x33x30 cm, measuring three units for treatment P3 (height 15cm), and three units measuring 30x25x30 cm for treatment P4 (height 20cm). The aquarium is first cleaned and soaked using PK (KMnO4) at a dose of 1 ppm for 24 hours. The function of soaking with PK solution is to prevent the growth of microorganisms in the container before use. After that, the container is dried.

Preparation of Larvae and Larval Rearing

The larvae used in this research were cachama larvae, called Ipur Fish, obtained from fish farmers in Bangkinang and farmers cultivated. The larvae used were four days old, with a total of 360 individuals and a stocking density of 2 ind/L.

Larval rearing is carried out for 40 days by feeding cachama. Fish larvae aged 3 to 7 days are fed *Artemia* sp, and larvae aged 7 to 40 days are fed *Tubifex* sp. *Artemia* sp feed is given as much as 15% for one administration) with a frequency of 3 times daily at 07.00 WIB, 15.00 WIB, and 23.00 WIB. According to Purnomo[11], feeding *Artemia* sp provides high nutrition for cachama and corresponds to the larva's mouth opening, namely 500-600 microns. Artemia naupli hatches in a container containing 1 L of water and 30 g of salt,

then is given vigorous aeration. For 1 L of water, 5 g of artemia cysts are used.

Meanwhile, *Tubifex* sp four times a day is 40% of body weight at intervals of 6 hours (07.00, 13.00, 19.00, and 01.00) WIB. Before *Tubifex* sp is given to the larvae, it must be washed first to remove the mud and dirt in the *Tubifex* sp. During the maintenance period, siphoning is carried out, and the water is changed at 30% of the total daily volume. Siphoning is done every day before feeding.

Observation of Larval Growth

Observations were measured. The weight gain and body length of larvae were carried out five times during the research period, namely on the first day, 10th day, 20th day, 30th day, and 40th day. Analytical scales were used to measure weight growth, while analytical scales were used to measure length growth. They used graph paper to know the growth of each fish during the fish larvae rearing process. Measurement of larval weight gain was done by taking 50% of the larvae/aquarium and then weighing them using an Ohaus scale with an accuracy of 0.001 g. The container used is a Petri placed on the scale and raised, then the fish are weighed one by one, and the results are recorded.

Meanwhile, to measure growth in length, larvae were taken from each treatment container as much as 50% of the total individuals in each treatment container. A petri dish filled with water was used, and one larva was put into the petri dish containing the larva. It was placed on graph paper, and its length was measured. The fish are measured individually, and then the results are recorded. Survival rate (SR) was measured during the research by counting the number of larvae that died in each treatment so that the survival rate for each treatment could be measured from the start to the end of the study.

Water Quality Measurement

The water quality parameters measured during the research were temperature, pH, and DO. These parameter measurements were carried out three times during the research, namely at the beginning, middle, and end. Measure temperature and pH using a thermometer by immersing it in water until the scale reading limit.

Parameters Measured

The parameters measured in this study were growth consisting of absolute weight growth (g), absolute length growth (cm), daily growth (%), and survival of test fish larvae (%).

3. RESULT AND DISCUSSION

Based on the results of research carried out for 40 days, the results of absolute weight growth (g), absolute length (cm), daily specific growth rate (%/day), and survival (%) of cachama larvae were obtained, presented in Table 1.

Table 1. Growth in absolute weight (g), absolute length (cm), and specific growth rate (%/day) and survival (%) of cachama larvae (*C. macropomum*) reared for 40 days at different water levels

Treatment (water level)	Absolute weight (g)	Absolute length (cm)	LPS (%/day)	Survival rate (%)
P1 (5cm)	1.73±0.22^{c}	4.59±0.28b	17.16±0.32c	91.11±1.92a
P2 (10cm)	1.48±0.01^{b}	4.00±0.43ab	16.78±0.02b	87.78±1.92a
P3 (15cm)	1.19 ± 0.12a	3.50±0.35a	16.22 ± 0.15a	86.67±3.33a
P4 (20cm)	1.05 ± 0.03a	3.45 ± 0.16a	15.93 ± 0.07a	85.56±1.96a

According to Putra[12], fish need energy for metabolism, physical activity, and growth. This energy is obtained from the food consumed by the fish. This is supported by Halver & Hardy[13], who explain that growth occurs when there is

excess free energy after the available energy is used for standard metabolism, digestive processes, and activities. Bioenergetic energy used by fish will be used directly for the maintenance process (maintaining life) of the fish.

The movement of larvae to get food at a height of 5 cm is shorter because the distance traveled is low and allows less energy to be used so that energy will be used optimally for growth. According to Priyadi et al.[14], at high water levels in rearing media, fish larvae will expend more energy to withstand water pressure when chasing prey when compared to rearing larvae at lower media water levels. This is by the research with the 5 cm treatment, which obtained the best weight gain value. It is assumed that the fish did not use much energy to maintain water pressure, so the energy was used for fish growth.

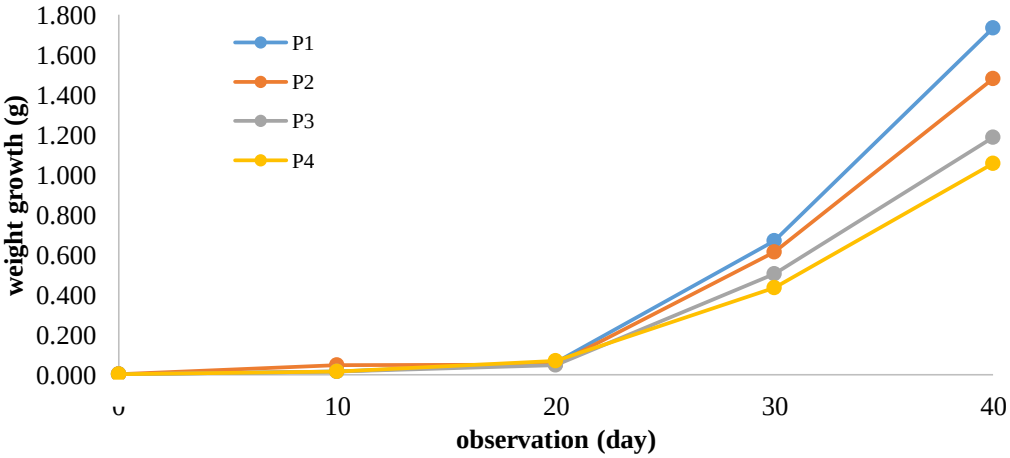

Figure 1. Weight growth of cachama larvae

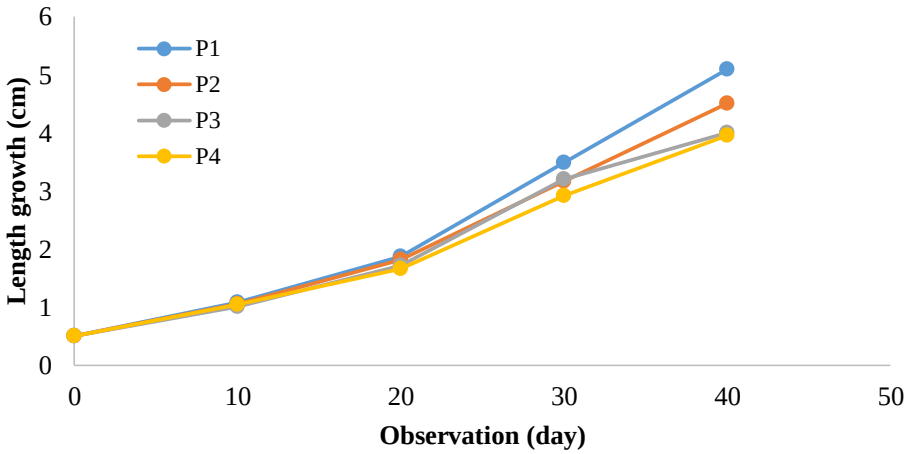

Figure 2. Length growth of cachama larvae

Absolute Weight Growth

The absolute weight growth of cachama larvae in each treatment during the study is presented in graphical form and seen in Figure 1. It is suspected that at a height of 5 cm during fish larvae rearing, the amount of feed responded well so that there was no food left in the rearing media, and there were differences in water level. According to Gunaidi et al.[15], the size of fish growth is influenced by fish behavior, where fish can allocate the energy they spend on the movement and growth of fish. Thus, the lower the water level, the higher the average absolute weight value of cachama fish larvae. Conversely, the higher the water level, the lower the average absolute weight value of cachama fish larvae.

Absolute Length Growth

Cachama larvae's average absolute length growth was highest in the 5 cm water height treatment, namely 4.59 cm, followed by the 10 cm water height treatment, namely 4.00 cm. The 15 cm water height treatment was 3.50 cm, and the lowest absolute length in the 20 cm water level treatment was 3.45 cm. This shows that the water level also influences Absolute weight gain and the increase in absolute length (Figure 2).

The absolute increase in larval length was highest in the 5 cm treatment, which resulted in 4.59 cm. This shows that water level influences the growth of fish length. It is suspected that the increase in fish body length is related to the increase in fish bone length, where growth occurs because the fish's nutritional needs are met optimally so that at a height of 5 cm, the fish can optimize the available food for fish growth in length.

Research by Sari et al.[16] shows that the highest absolute length increase in both fish was achieved by rearing larvae with a water level of 5 cm, which is 0.42 cm. This is because the height of 5 cm of water larvae can save energy in moving around searching for food so that the available energy can be used for growth. In research by Estrada et al.[8] regarding different water levels in keeping snakehead fish, the highest growth value was obtained in the container with the lowest water level, namely 5 cm.

Specific Growth Rate

The highest average specific growth rate of cachama larvae obtained from the research was in the 5 cm water height treatment, namely 17.16%, followed by the 10 cm water height treatment, namely 16.78%, followed by the 15 cm water height treatment, which was 16.23%, and the lowest average specific growth rate of cachama larvae in the 20 cm water height treatment was 15.93%.

According to research by Alputra et al.[1], which stated that the highest average specific growth rate was obtained at a water level of 5 cm of 17.54%/day. Then, Sunar et al.[17] stated that a water level of 6 cm gave the best specific growth rate in rearing Asian redtail catfish larvae. Several factors influence Specific growth rates, ranging from food availability to environmental conditions. Subhan[18] stated that the availability of food and conditions of the aquatic environment influence the specific growth rate of fish. Continuous availability of feed will ensure reasonable fish growth rates, while environmental conditions will also greatly influence the specific growth rate. If the water environmental conditions are good and meet the fish's tolerance, the fish's appetite will be high. However, on the other hand, if the water environmental conditions are wrong, the fish's appetite will decrease, and this will even cause the fish's weight to decrease.

Survival Rate

The results of research on different water levels on cachama larvae that were reared for 40 days showed an average survival value ranging from 85.56 to 91.11%. The survival value of cachama larvae in the treatment with a water height of 5 cm was 91.11%, followed by the 10 cm treatment at 87.78%, the 15 cm treatment at 86.67%, and the 20 cm produces a value of 85.56%. The survival rate in this study was classified as good. This is by Husen *in* Subhan[18], which states that a survival rate of≥ 50% is considered good. According to Afdola et al.[19], rearing cachama at different water levels does not influence the survival of both fish larvae. The same thing was also explained by Haris et al.[7], namely that water level had no discernible effect on the survival of goldfish.

This is because the environmental carrying capacity still meets the needs of each population, and the larvae's need for food is met. Armiah[20] explained that fish survival is influenced by two factors: external and internal factors. External factors include abiotic factors, competition between species, fish stocking density,

increased predators and parasites, and food shortages. Meanwhile, internal factors include age and the fish's ability to adapt to its environment.

Water Quality

These parameter measurements were carried out three times during the research, namely at the beginning, middle, and end. The research container's temperature, pH, and DO were measured in the morning. The range of water quality values during the study can be seen in Table 2.

Table 2. Water quality measurement

No	Parameter	Results		
		Beginning	Middle	End
1	Temperature (^{0}C)	26.7-27.9	27.1-28.4	27.5-28.1
2	pH	6.0-6.9	6.0-6.8	6.0-6.5
3	DO (ppm)	5.2-5.8	5.3-5.7	5.2-5.9

The results of temperature measurements during the research ranged from 26.7^{0}C – 28.4^{0}C. This temperature value is relatively stable and is still within the optimal temperature range for the growth of freshwater pomfret larvae so that they can grow well. Djarijah[21] explained that cachama can live at temperatures. Cachama can live at temperatures between 25-30^{o}C, where the optimal range for growth is between 27-29^{o}C. During the larval rearing period, the rise and fall of water temperature dramatically influences the survival of fish larvae. Temperature changes that are too extreme will hurt the survival and growth of the reared larvae. As a result, larvae will easily experience stress and become more susceptible to disease[22].

4. CONCLUSION

The research results on different water levels showed a real influence on the growth of absolute weight, absolute length, and specific growth rate of cachama larvae ($p<0.05$). They did not affect the survival of cachama larvae ($p>0.05$). The best treatment was at a water level of 5 cm, with absolute weight growth of 1.73 g, absolute length growth of 4.59 cm, specific growth rate of 17.16%/day, and survival of 91.11%. The temperature of the maintenance container ranges from 26.7^{0}C to 28.40C, pH is 6.0 to 6.9, and DO ranges from 5.2 to 5.9 mg/L.

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