Jurnal Pertanian Terapan of JURNAL ROCE (AGROSCIENCE)
https://jurnal.rocewisdomaceh.com/index.php/roce e-ISSN : 3032-4505
Vol. 2, No. 1, Thn. 2025
https://doi.org/10.71275/roce.v2i1.83

EVALUATION OF THE EFFECTIVENESS OF DIFFERENT CULTURE MEDIA ON THE DOMESTICATION OF FRESHWATER LOBSTER (*Cherax quadricarinatus*)

EVALUASI EFEKTIVITAS MEDIA PEMELIHARAAN YANG BERBEDA PADA DOMESTIKASI LOBSTER AIR TAWAR (*Cherax quadricarinatus*)

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Abstract

This study aimed to investigate the role of different culture media in the domestication process on the survival rate of freshwater lobster (*Cherax quadricarinatus*). The study employed a field experimental method with four treatment groups, namely freshwater media, flowing water media, plankton-enriched water media, and Lactobacillus-enriched water media. The results showed that freshwater lobster's survival rate (SR) ranged from 26% to 97%. The freshwater media treatment had the highest SR value (97%), while the *Lactobacillus*-enriched water media treatment had the lowest SR value (26%). Analysis of water quality parameters indicated that temperature, pH, and other water quality parameters met the standards required for freshwater lobster cultivation. The results of this study suggest that the application of different culture media can maintain the survival rate of freshwater lobster.

***Keywords**: Culture Media, Domestication, Lactobacillus, Water Quality*

Abstrak

Penelitian ini bertujuan untuk mengetahui peran media pemeliharaan yang berbeda dalam proses domestikasi terhadap kelangsungan hidup lobster air tawar (*Cherax quadricarinatus*). Penelitian ini menggunakan metode eksperimen lapangan dengan empat perlakuan pengujian, yaitu media air tawar, media air mengalir, media air yang diperkaya plankton, dan media air yang diperkaya *Lactobacillus*. Hasil penelitian menunjukkan bahwa nilai kelangsungan hidup (KH) lobster air tawar mencapai 26-97%. Perlakuan media air tawar memiliki nilai KH tertinggi (97%), sedangkan perlakuan media air yang diperkaya *Lactobacillus* memiliki nilai KH terendah (26%). Analisis parameter kualitas air menunjukkan bahwa suhu, pH, dan kualitas air lainnya memenuhi standar yang diperlukan untuk pemeliharaan lobster air tawar. Hasil penelitian ini menunjukkan bahwa aplikasi media pemeliharaan yang berbeda dapat mempertahankan nilai atau tingkat kelangsungan hidup lobster air tawar.

Kata kunci: Media pemeliharaan, Domestikasi, *Lactobacillus*, Kualitas Air

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INTRODUCTION

One of the aquatic organisms that inhabit freshwater ecosystems is the freshwater lobster (*Cherax quadricarinatus*). Indonesia offers significant opportunities and potential for freshwater lobster cultivation. With its vast archipelago, the country boasts extensive water resources spanning marine, estuarine, and freshwater environments. Freshwater lobster (*Cherax quadricarinatus*) aquaculture has been underway since the mid-1990s. Unlike marine lobster, which remains dependent on wild-caught fisheries and has yet to be commercially cultivated (Fadlan *et al.,* 2021).

The red claw crayfish (*Cherax quadricarinatus)* shows considerable promise as a cultured species, owing to its rapid growth rate and brief larval stage. Furthermore, this species has demonstrated remarkable resilience to environmental fluctuations, including adaptability to novel habitats with dynamic ecological parameters. The successful cultivation of *C. quadricarinatus* in non-tropical regions underscores its exceptional adaptability and capacity to thrive in varied environmental conditions (Papuntung *et al*., 2021).

The cultivation process of *Cherax quadricarinatus* in Indonesia generally still relies on commercial pellets as a food source. Feed consumption requirements, physical and chemical water parameters, and dissolved oxygen levels are key factors that must be met to support the growth and development of freshwater lobster (*Cherax quadricarinatus*). By fulfilling these requirements, this species can exhibit rapid growth rates and has the potential to be developed as a fisheries commodity (Lengka *et al.*, 2013).

The feeding technique commonly used is the ad libitum method, where food is provided in abundance. For the freshwater lobster (*Cherax quadricarinatus*), pellets are typically administered twice daily, at 06:00-08:00 am and 16:00-18:00. This feeding regimen is designed to ensure that the daily nutritional needs of the lobsters are met, thereby supporting optimal growth and development (Asnawi & Mingkid, 2021). According to Takril (2018), the cultivation of freshwater lobster as a fisheries commodity is becoming increasingly viable and will continue to be developed on a large scale and in a synergistic manner. This is fueled by the rising popularity of freshwater lobster among both farmers and consumers (the general public). Similar to other aquatic biota, freshwater lobster also possesses various advantages (Budi *et al.,* 2019*). Cherax quadricarinatus* is an introduced aquatic species from outside Indonesia that has successfully adapted and is being cultivated, possessing economic value as both ornamental crustaceans and food biota (Dina *et al.,* 2013).

Domestication refers to the process of adapting wild animals from their natural habitats to a controlled environment (Rachmawati, 2012). Muslim & Syaifudin (2012), defined domestication as the process of transitioning free-living or wild aquatic animals to a cultivated state through a series of stages, including maintaining their survival rate in a controlled aquaculture setting.

The objective of this study is to assess the impact of various maintenance media on the survival rate and health of freshwater lobster (*Cherax quadricarinatus*) during the domestication process. This research aims to provide new insights into the effective use of alternative handling

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media for freshwater lobsters (*Cherax quadricarinatus*) transferred from their natural highland habitat to a new environment to reduce mortality rates in cultivated lobsters.

RESEARCH METHODS

Materials and Tools

The tools used in this study include tarpaulin ponds, water pumps, aerator pumps, PVC pipes, cameras, weighing scales, rulers, stationery, pH meters, and thermometers. The materials utilized in this research comprise lobsters, commercial pellet feed, freshwater, plankton culture media, and lactobacillus culture media.

Experimental Design

This research employed a field experimental approach comprising four treatment groups, with each treatment replicated 5 times, yielding a total of 20 experimental configurations.

A = Freshwater Control Treatment
B = Flowing Water Treatment
C = Plankton-Supplemented Water Treatment
D = Lactobacillus-Supplemented Water Treatment

Preparation of Test Organisms

The test subjects used in this research were freshwater lobsters sourced from collectors or fishermen in Central Aceh, which had undergone prior acclimatization. The lobsters were then transported to Aceh Besar by land, a journey lasting 8 hours. Following their extended travel, the lobsters were weighed to establish an average weight range of 20-35 grams. Based on the calculation, 1 kg of test biota was allocated per container, and subsequently, they were introduced into the test media.

Research Container Preparation

This study employed tarpaulin ponds as research containers, with preparation involving the creation of 100 x 100 x 50 cm ponds, which were thoroughly cleaned before use. To eliminate the tarpaulin smell, sufficient water was added to the ponds, followed by a 3-day settling period. Subsequently, water was added to a depth of 25 cm, and aeration systems were installed in each container to provide a consistent supply of dissolved oxygen in the water media.

Treatment B (flowing water media) involved the installation of a water pump to generate continuous water circulation. Treatment C utilized water from a phytoplankton-based plankton culture media. For Treatment D, freshwater was used, supplemented with Lactobacillus probiotics.

Lobster Feeding and Monitoring

Nutrition is essential for the growth of freshwater lobsters. A commercial pellet feed containing 38-40% protein and 5% fat was provided. The optimal balance of protein and energy is critical in formulating artificial diets for freshwater lobsters. Pellets were fed ad libitum daily at

18:00 WIB, as freshwater lobsters exhibit increased nocturnal feeding activity. Water quality parameters were monitored twice daily, while lobster survival rates were recorded at the commencement and conclusion of the study.

Experimental Observation Parameters

Survival Rate (SR)

The survival rate of freshwater lobsters was determined using the following equation:

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

Description :

SR: Survival Rate (%)
Nt: End Number of Lobster (tail)
No: Starting Number of Lobster (tail)

Water Quality Parameters

Regular water quality monitoring of the experimental media was performed twice daily, at 08:00 and 16:00 hours. The two water quality parameters monitored were water temperature and pH. Consistent daily measurements were taken throughout the study.

RESULT AND DISCUSSION

Survival Rate (SR)

The results of the study showed that the survival rate of *Cherax quandricarinatus* ranged from 26% to 97% over the experimental period. The lowest survival rate (26%) was recorded in treatment D, where the water media was enriched with *Lactobacillus* bacteria. In contrast, the highest survival rate (97%) was achieved in treatment A, which served as the control using freshwater media. A detailed comparison of the treatments is presented in Figure 1.

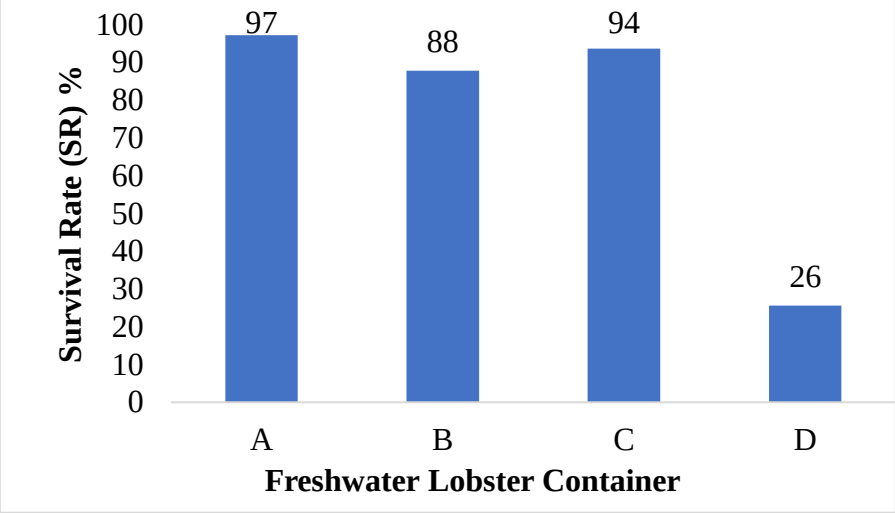

Figure 1. Survival Rate

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Based on Figure 1, the results of the observation on the domestication of freshwater lobsters (*Cherax quandricarinatus*) imported from Central Aceh and then cultivated in Aceh Besar with four treatments, namely A = Freshwater media/ (Control), B = Water system media, treatment C = Water media enriched with plankton, and treatment D = Water media enriched with lactobacillus. The lowest survival rate during domestication can be seen in Figure 1, which is found in treatment D = Water media enriched with lactobacillus with a value of 26% with a mortality rate of 32 lobsters out of an initial 43 lobsters during the 7-day observation period.

The highest survival rate was found in treatment A = Freshwater media/ (control) with a survival rate of 97% and a mortality rate of 1 individual freshwater lobster (*Cherax quadricarinatus*) out of an initial population of 35 lobsters during the 7-day observation period. This was not significantly different from the survival rate observed in treatment C = Plankton-enriched water media, which yielded a survival rate of 94% and a mortality rate of 3 individuals out of an initial population of 47 lobsters.

Analysis of the research results showed that treatment A (freshwater media) had the highest survival rate (97%) for freshwater lobsters (*Cherax quadricarinatus*). The natural habitat of freshwater lobsters, such as lakes, swamps, and rivers, reflects their habitat preferences. From a taxonomic perspective, freshwater lobsters are classified into three families: *Astacidae, Cambaridae, and Parastacidae,* which have a wide geographic distribution worldwide (Muhammad *et al*., 2022).

The survival rate of *Cherax quadricarinatus* in treatment C, which employed plankton-enriched water media, reached 94%. The presence of plankton in the water media facilitated the growth of freshwater lobsters. As a nutrient-rich food source, plankton provides a balanced diet for lobsters, promoting healthy growth and development (Zaqyah, 2015). Phytoplankton are essential components of aquatic ecosystems, generating organic matter through photosynthesis, which serves as a food source for freshwater lobsters and other organisms. Furthermore, plankton contributes to the oxygen availability necessary for freshwater lobster culture (Putra *et al.,* 2024).

Santoso (2015) stated that phytoplankton photosynthesis produces oxygen as a by-product of converting light energy into chemical energy. This oxygen is vital for freshwater lobsters, as it supports their respiratory and growth processes (Christwardana *et al.,* 2013). Nur *et al.* (2014), emphasized that plankton are a natural source of protein, carbohydrates, and essential fatty acids, providing lobsters with the necessary energy. To promote optimal growth and development, high-quality feed must have a higher protein content than carbohydrate content.

The survival rate of *Cherax quadricarinatus* in treatment B, which employed flowing water media, reached 88% during the 7-day observation period. The dissolved oxygen levels in the flowing water media effectively supported the growth of freshwater lobsters. The flowing water conditions helped maintain optimal water quality parameters, including pH, temperature, and ammonia levels. However, Toro *et al.* (2024), reported a significantly higher survival rate of 97% in flowing water media over 30 days, highlighting the importance of flowing water systems for aquatic biota. As noted by Widigdo *et al.* (2020), freshwater lobsters are well-adapted to living in a variety of freshwater environments, including both lentic and lotic waters, such as rivers and lakes.

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Temperature

Water temperature has a significant impact on the metabolic rate of lobsters and the solubility of oxygen in water. As water temperature increases, oxygen consumption rises, and oxygen levels in the water decrease, resulting in a higher oxygen demand for aquatic organisms. Permanasari *et al*. (2019), reported that the ideal water temperature for freshwater lobster culture falls within the range of 26°C to 30°C. The results of temperature observations over 7 days showed a temperature range of 26-27°C. The temperature measurement values are presented in Table 1.

Table 1. Mean Temperature Observation Data

Treatment	Morning (08.00 am)	Afternoon (06.00 pm)
A	26^{O}C	27^{O}C
B	26^{O}C	27^{O}C
C	26^{O}C	27^{O}C
D	26^{O}C	27^{O}C

Throughout the study, the water temperature in all media ranged from 26-27°C, which is considered suitable for the survival of freshwater lobsters (*Cherax quadricarinatus*). Ernawati & Chrisbiyantoro (2014) reported that the optimal temperature for freshwater lobster life is between 25-26°C. Temperatures outside this range can have detrimental effects on lobster life. In contrast, Zakaria (2010) found that the optimal temperature for lobster growth is between 26-32°C. Water temperatures below 20°C or above 30°C can impede the growth of freshwater lobsters (*Cherax quadricarinatus*), leading to decreased appetite (Setiawan, 2010).

Water pH Level

The pH measurements recorded during the study indicated a pH range of 6-7. Arsad *et al*. (2017), reported that the optimal pH range for the growth of lobsters and shrimp is between 7 and 8.5. The detailed data are presented in Table 2.

Table 2. Mean pH (pH Level) Observation Data

Treatment	Morning (08.00 am)	Afternoon (06.00 pm)
A	7,70	7,60
B	7,60	7,60
C	7,60	7,60
D	7,65	7,80

Table 2 reveals that the highest average pH value was obtained in treatment D, with a pH of 7.80, whereas treatments B and C exhibited the lowest average pH value, at 7.60. Minor pH fluctuations can be indicative of disruptions to the buffering system. Nevertheless, in the context of tarpaulin pond media, pH changes were found to be insignificant, as freshwater tends to maintain a relatively stable pH with minimal fluctuations. Wiyanto & Hartono (2003), reported that the optimal pH range for effective cultivation of freshwater lobsters (*Cherax quadricarinatus*) is between 7.0 and 8.0, emphasizing the importance of maintaining stable and neutral water pH conditions to support lobster growth and survival.

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CONCLUSION

This study's findings demonstrate that employing different maintenance media in conjunction with the domestication process of freshwater lobsters (*Cherax quadricarinatus*) can effectively maintain lobster survival rates. Water quality parameter analysis revealed that treatment A (freshwater media) exhibited morning and afternoon temperature values of 26°C and 27°C, respectively, and a pH of 7.62. Conversely, treatment D (*Lactobacillus*-enriched water media) displayed morning and afternoon temperature values of 26°C and 27°C, respectively, with corresponding morning and afternoon pH values of 7.65 and 7.80, respectively.

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