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THE IMPACT OF GIVING JAKABA MUSHROOM WITH DIFFERENT DOSES IN THE CULTIVATION OF *Infusoria* sp.: A STUDY OF NITRITE, NITRATE, AND PHOSPHATE LEVELS

Dampak Pemberian Jamur Jakaba dengan Dosis Berbeda dalam Budidaya *Infusoria* sp.: Study Tentang Kadar Nitrit, Nitrat, Dan Fosfat

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ABSTRACT

Seed quality and feed quality are major issues in fish and shrimp farming. Infusoria is a natural microorganism as feed for fish and shrimp larvae, infusoria need a nutrient-rich environment to grow and develop. This study aims to determine the impact of giving Jakaba mushrooms with different doses on the content of important nutrients such as nitrites, nitrates, and phosphates in infusoria cultivation. This research will be carried out at the Integrated Fisheries Laboratory of Bosowa University in February 2024. This study used the quantitative experimental method Complete Randomized Design (RAL) with three treatments and three repeats. Infusoria sp with a density of 1.2 x 105 individuals / liter is maintained in a container with a volume of 1.5 liters filled with water used for fish maintenance. The process of making Jakaba mushrooms is by breeding the finished Jakaba mushrooms into leri water, then fermented for approximately fourteen days. The application of Jakaba mushroom fertilizer is carried out on the seventh day after the Infusoria culture is carried out according to the treatment dose, namely: treatment A (15 ml/ liter); B (20 ml/ liter and C (25 ml/ liter). The results showed that giving Jakaba mushrooms with a dose of treatment C (25 ml / 1 liter) resulted in nitrite, nitrate levels of 0.334 ppm, 0.632 ppm and 0.334 ppm respectively.

Keywords: *Infusoria*, Jakaba Mushroom, Natural Feed, Seed Availability, Water Quality

ABSTRAK

Kualitas benih dan kualitas pakan merupakan masalah utama dalam budidaya ikan dan udang. Infusoria adalah mikroorganisme alami sebagai pakan larva ikan dan udang, infusoria membutuhkan lingkungan yang kaya nutrisi untuk tumbuh dan berkembang. Penelitian ini bertujuan untuk mengetahui dampak pemberian jamur Jakaba dengan dosis berbeda terhadap kandungan nutrisi penting seperti nitrit, nitrat, dan fosfat dalam budidaya infusoria. Penelitian ini dilaksanakan di Laboratorium Terpadu Perikanan Universitas Bosowa pada bulan Februari

2024. Penelitian ini menggunakan metode eksperimental kuantitatif Rancangan Acak Lengkap (RAL) dengan tiga perlakuan dan tiga kali pengulangan. Infusoria sp dengan kepadatan 1.2 x 10^5 individu/ liter dipelihara dalam wadah dengan volume 1,5 liter diisi dengan air bekas pemeliharaan ikan. Proses pembuatan jamur Jakaba yaitu dengan mengembangbiakkan jamur Jakaba yang sudah jadi kedalam air leri, lalu difermentasi selama kurang lebih empat belas hari. Pengaplikasian pupuk jamur Jakaba dilakukan pada hari ketujuh setelah kultur Infusoria dilakukan sesuai dengan dosis perlakuan yaitu : Perlakuan A (15 ml/1 liter); B (20 ml/1 liter dan C (25 ml/1 liter). Hasil penelitian menunjukkan bahwa pemberian jamur Jakaba dengan dosis perlakuan C (25 ml/1 liter) menghasilkan kadar nitrit, nitrat masing-masing sebesar 0,334 ppm, 0,632 ppm dan 0,334 ppm.

Kata kunci: *Infusoria*, Jamur Jakaba, Ketersediaan Benih, Kualitas Air, Pakan Alami.

INTRODUCTION

Infusoria cultivation in the aquaculture and fish feed industry has an important role. (Leyva-López *et al*., 2020), because Infusoria are natural microorganisms that are eaten by fish and shrimp larvae, infusoria require a nutrient-rich environment to grow and develop (Fidelis, 2018; Sarker, 2023). One of the important nutrients needed by Infusoria is nitrite, nitrate, and phosphate (Farooqui *et al*., 2013). Currently, finding effective and sustainable nutrient sources is very important to ensure that infusoria have sufficient nutrient availability. Jakaba mushrooms have been known as a potential food source for Infusoria cultivation (Kamthan & Tiwari, 2017). Jakaba mushrooms can help aquaculture systems become more sustainable and environmentally friendly, improve the health and productivity of shrimp and fish, and reduce the negative impacts caused by aquatic ecosystems.

The use of Jakaba mushrooms in *infusoria* sp. cultivation plays a role in regulating water quality, especially how to influence nitrite, nitrate, and phosphate levels. As a natural food for fish larvae, *infusoria* sp. requires an ideal balance of nutrients and water quality. The use of Jakaba mushrooms is expected to change the microenvironment and support a more productive and healthy ecosystem.

In *Infusoria* sp. cultivation, variations in the dosage of Jakaba mushrooms can affect the levels of nitrite, nitrate, and phosphate in the culture medium. Nitrite and nitrate are types of nitrogen that are often produced from leftover feed and organic matter, and phosphate is an important nutrient for aquatic organisms, but if the levels are too high, it can cause eutrophication, which is excessive growth of algae and bacteria, which can ultimately reduce water quality and disrupt the balance of the ecosystem.

The right dosage of Jakaba mushrooms can help balance the levels of nitrite, nitrate, and phosphate in the cultivation system. The nitrification and denitrification processes, where nitrite is converted into nitrate which can then be broken down into nitrogen gas, will be accelerated with the ideal dosage of Jakaba mushrooms.

The current problem is related to the lack of comprehensive research data regarding the effect of variations in Jakaba mushroom doses on phosphate, nitrite, and nitrate levels in Infusoria cultivation. This study aims to determine the impact of giving Jakaba mushrooms with different doses on the content of important nutrients such as nitrite, nitrate, and phosphate in infusoria cultivation. This study is expected to provide a significant contribution to the development of more effective and sustainable Infusoria growth techniques. By understanding the effect of giving Jakaba mushrooms on the nutrient content in infusoria cultivation.

RESEARCH METHODS

This research was conducted at the Integrated Fisheries Laboratory of Bosowa University from February to April 2024.

The tools and materials used in this study can be seen in Tables 1 and 2.

Tabel 1. Tools Used in Research.

No	Tool	Amount	Unit	Utility
1	Receptacle 1.5 L plastic	9	Fruit	Maintenance container
2	Test kit Pro JBL Aquatest Vorsprung Durch Forschung	1	Fruit	Kit for measuring Nitrite, Nitrate and Phosphate

Tabel 1Materials Used in Research.

No	Material	Utility
1	Infusoria	Test animals
2	Jakaba Mushroom	Source of feed protein
3	Leri water	Source of feed protein
4	Dried banana leaves	Infusoria culture
5	Water used pisciculture	Infusoria culture

The test animals used in this study were *Infusoria* sp. obtained from the Parang Tambung Makassar Fish Seed Center. *Infusoria* sp. were cultured using dried banana leaves soaked for approximately seven days in used fish maintenance water and not exposed to sunlight. After soaking for approximately seven days, *Infusoria* sp. were harvested (Mukai *et al*., 2016). *Infusoria* sp. with a density of 1.2 x 105 individuals/liter were maintained in a container with a volume of 1.5 liters filled with 1 liter of used fish maintenance water. The process of making Jakaba mushrooms is by cultivating the finished Jakaba mushrooms in leri water, then fermenting them for approximately fourteen days (Dong & Cai, 2022; Yusminan *et al*., 2022). The application of Jakaba mushroom fertilizer was carried out on the seventh day after the Infusoria sp. culture was carried out according to the treatment dose. The treatment doses used in the research (Elmi *et al*., 2018; Rihman, 2022) can be seen in Table 3.

Table 3. Treatment Doses in Research

Treatment	Dose
A	15 ml/1 liter
B	20 ml/1 liter
C	25 ml/1 liter

This research is an experimental research with quantitative methods. This study used a Completely Randomized Design (CRD) which was repeated three times for each treatment.

Measurement of Nitrite, Nitrate and Phosphate levels was carried out twice a day, namely in the morning and evening at 08.00 and 16.00. The data obtained were recorded and stored in table format for further analysis.

Data Analysis

Data analysis includes data tabulation using Microsoft Excel and to compare differences in nitrite, nitrate, and phosphate content between treatments using variance (ANOVA) and If there is a significant difference, further testing is carried out using the Tukey method at a 95%

confidence level (Aziza *et al*., 2024). The statistical test tool used in this study is SPSS software version 26.0.

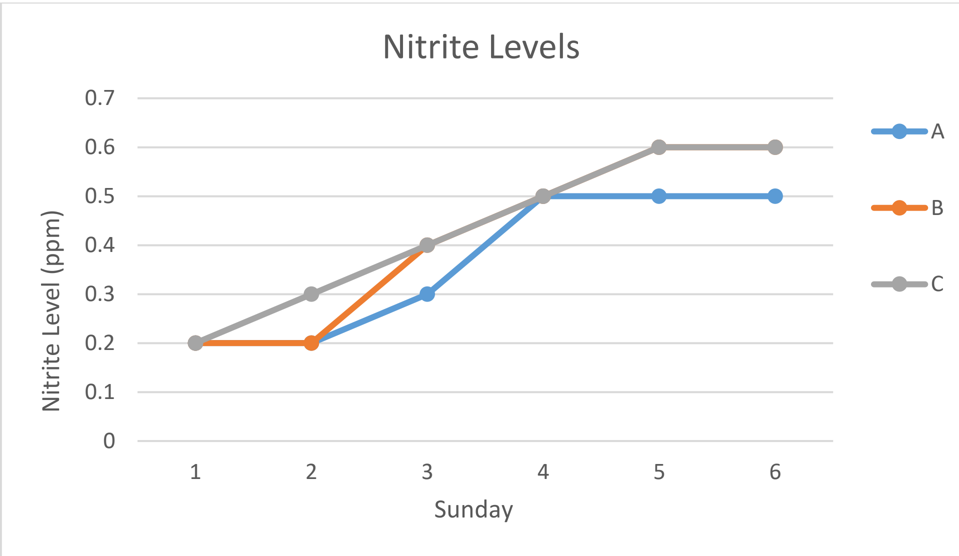
RESULTS

Measurement of the impact of administering Jakaba mushrooms at different doses on the levels of nitrite, nitrate, and phosphate nutrients during the study can be seen in Table 4 below:

Table 4. Average levels of nitrite, nitrate and phosphate in the study

Treatment	Average Nitrite Levels (ppm)	Average Nitrate Level (ppm)	Average Phosphate Content (ppm)
A (15 ml/1 liter)	0.315 [a]	0.59 7 [a]	0.315 [a]
B (20 ml/1 liter)	0.32 2 [a]	0.608 [a]	0.32 2 [a]
C (25 ml/1 liter)	0.333 [a]	0.63 2 [a]	0.33 4 [a]

The results of the analysis of variance showed that treatments A, B and C, the levels of nitrite, nitrate and phosphate nutrients during the study did not show significant differences ($p>0.05$). The graphic images of the average levels of nitrite, nitrate and phosphate during the study can be seen in figures 1, 2 and 3 below.



Graph 1. Average Nitrite Levels During the Study

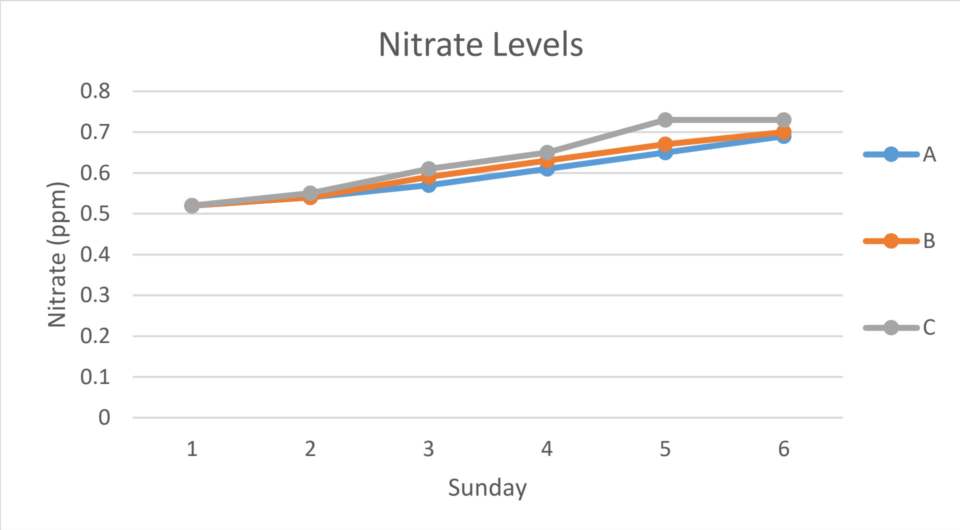


Chart 2. Average Nitrate Levels During the Study

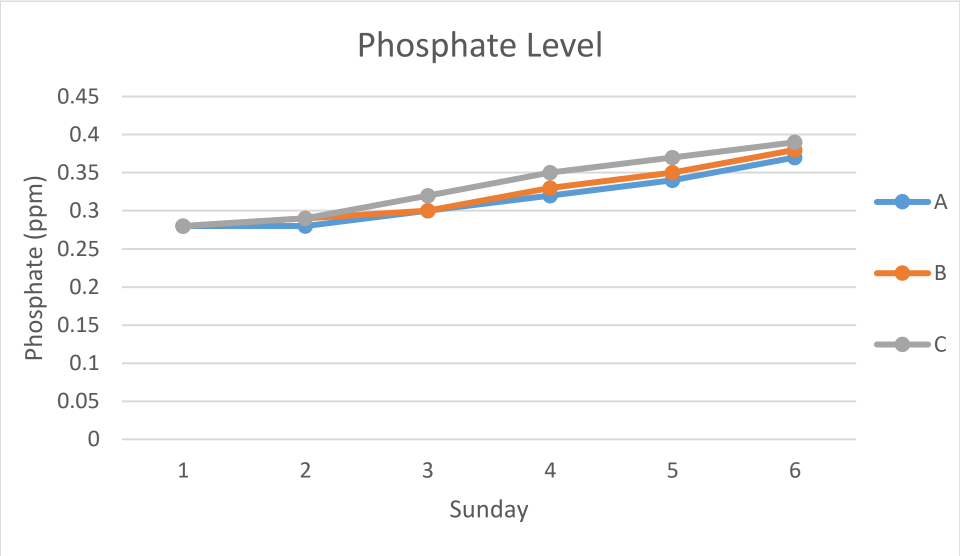


Chart 3. Average Phosphate Levels During the Study

DISCUSSION

Nitrite Levels

Measurement of nitrite levels in the administration of Jakaba mushrooms with different doses in *Infusoria* sp. cultivation (Figure 1), showed the highest results in treatment C (25 ml/1 liter) which was 0.334 ppm, then treatment B (20 ml/1 liter) of 0.322 ppm, then treatment A (15 ml/1 liter) of 0.315 ppm. Treatment C had a higher nitrite content than treatments A and B, it is suspected that the administration of Jakaba mushrooms for *infusoria* sp. cultivation can affect the nitrite content of water. Research by Han *et al*., (2018) showed that nitrite content was influenced by fertilizer conditions. Treatment C (25 ml/1 liter) was better able to influence the distribution and diversity of nitrite oxidizing bacteria affecting nitrification activity, with the abundance of ammonia oxidizing bacteria (AOB) (Lin *et al*., 2018). Therefore, it is very important to pay attention to the nitrite levels of water when cultivating Infusoria with Jakaba mushrooms to optimize the nutrient content and evaluate its effects on the environment.

Nitrate Levels

Measurement of nitrate levels in the administration of Jakaba mushrooms with different doses in *Infusoria* sp. cultivation (Figure 2), showed the highest results in treatment C (25 ml/1 liter) which was 0.632 ppm, then treatment B (20 ml/1 liter) of 0.608 ppm, then treatment A (15 ml/1 liter) of 0.597 ppm. Treatment C had a higher nitrate content than treatments A and B, it is suspected that treatment C (25 ml/1 liter) affects the availability of nitrogen in *Infusoria* sp. cultivation. (Pfannmüller *et al.*, 2017). Research (Pfannmüller *et al.*, 2017) shows that nitrate is the main source of nitrogen and nitrate absorption is controlled by the suppression of nitrogen metabolites.

Phosphate Levels

Measurement of nitrate levels in the administration of Jakaba mushrooms with different doses in *Infusoria* sp. cultivation (Figure 3), showed the highest results in treatment C (25 ml/1 liter) which was 0.334 ppm, then treatment B (20 ml/1 liter) of 0.322 ppm, then treatment A (15 ml/1 liter) of 0.315 ppm. Treatment C has a higher nitrate content than treatments A and B, it is suspected that the administration of treatment C (25 ml/1 liter) can increase the available phosphorus content (Islam & Datta, 2023).

Relationship of Nitrite, Nitrate, and Phosphate

The presence of sufficient nitrate in the cultivation system will increase the growth of bacteria and phytoplankton which then become food for infusoria sp (Amin *et al*., 2023). In contrast, infusoria usually do not consume nitrite which is an intermediate form in the nitrogen cycle, but its concentration must be kept low because it is harmful to many aquatic organisms. Jakaba fungi can convert nitrite to nitrate during the nitrification process, thus providing a safer and more beneficial form of nitrogen for the aquatic ecosystem. Phosphate is an essential nutrient for the growth of bacteria and phytoplankton (Wang *et al*., 2023). Phosphate helps in photosynthesis and cell synthesis, so if there is enough phosphate, the biomass of bacteria and phytoplankton will increase and infusoria will have more food (Zhang *et al*., 2023).

The growth of bacteria and phytoplankton, which are the main food of infusoria sp., can be controlled by regulating the levels of nitrite, nitrate, and phosphate. Jakaba fungus plays an important role in maintaining the balance of creating an ideal environment for the growth of infusoria sp. through better air quality management. As a result, the presence of nutrients such as nitrite, nitrate, and phosphate in the right amounts increases the productivity and health of infusoria, which ultimately also helps the successful cultivation of other aquatic organisms.

CONCLUSION

Based on the results of the study, it can be concluded that the administration of Jakaba mushrooms with different doses on the levels of nitrite, nitrate, and phosphate in infusoria cultivation did not differ significantly between treatments. The highest levels of Nitrite, Nitrate and Phosphate were each shown in treatment C (25 ml/1 liter) of 0.334 ppm, treatment C (25 ml/1 liter) of 0.632 ppm and treatment C (25 ml/1 liter) of 0.334 ppm. This study is in line with the government program that encourages the availability of quality natural feed to support the blue economy program in the aquaculture sector.

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