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The Effect of the Utilization of Fermented Tofu Waste Products on Hatching Rate and Survival Rate of Climbing Perch (*Anabas testudineus*)

Pengaruh Konsentrasi Limbah Cair Tahu terhadap Daya Tetas Telur dan Sintasan Larva Ikan Puyu (*Anabas testudineus*)

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ABSTRACT

Climbing perch (*Anabas testudineus*) is a type of swamp fish that has the potential to be cultivated. The obstacle faced in developing climbing perch cultivation is that the eggs produced are very few and vulnerable to inorganic substances or waste because it takes quite a long time to reach seed size. Climbing perch usually food aquatic plants such as kiambang, weeds, and other small animals and insects. It analyzes the effect of various concentrations of tofu liquid waste on the transparent hatchability and survival of climbing perch larvae and the use of research results on the influence of various concentrations of tofu liquid waste on the transparent hatchability and survival of climbing perch fish larvae. A 100% concentration of tofu liquid waste produced the highest survival in the P4 treatment (64.00%), and the lowest concentration without giving tofu liquid waste concentration at P0 was (40.00%). A 100% concentration of tofu liquid waste produced the highest hatchability in the P4 treatment (60.00 %), and the lowest concentration without providing tofu liquid waste at P0 was (42.00 %). The research fulfilled the maintenance requirements by utilizing fermented tofu liquid waste as a medium for rearing climbing perch eggs and larvae. It is not possible to use 100% tofu liquid waste for climbing perch, and it is not possible to use 100% tofu liquid waste for climbing perch larvae in the long term.

Keywords: Climbing perch, Tofu liquid waste, survival

ABSTRAK

Ikan puyu *(Anabas testudineus)* merupakan salah satu jenis ikan rawa yang berpotensi untuk dibudidayakan. Kendala yang dihadapi dalam pengembangan budidaya ikan puyu adalah telur yang dihasilkan sangat sedikit dan rentan akan suatu zat anorganik atau limbah karena untuk mencapai ukuran benih memerlukan waktu yang cukup lama. Makanan ikan puyu yang biasa dimakan adalah tumbuh-tumbuhan air seperti kiambang, gulma, hewan-hewan kecil lainnya, dan serangga. Menganalisis pengaruh berbagai konsentrasi limbah cair tahu terhadap daya tetas telus dan sintasan larva ikan puyu dan Mengetahui pemanfaatan hasil penelitian pengaruh berbagai konsentrasi limbah cair tahu terhadap daya tetas telus dan sintasan larva ikan puyu. Konsentrasi limbah cair tahu 100 % menghasilkan sintasan tertinggi perlakuan P4 sebesar (64,00 %) dan terendah tanpa pemberian konsentrasi limbah cair tahu pada P0 sebesar (40,00 %). Konsentrasi limbah cair tahu 100 % menghasilkan daya tetas tertinggi perlakuan P4 sebesar (60,00 %) dan terendah tanpa pemberian konsentrasi limbah cair tahu pada P0 sebesar (42,00 %). Pada penelitian sudah memenuhi syarat pemeliharaan dengan memanfaatkan limbah cair tahu yang difermentasi sebagai media pemeliharaan telur dan larva ikan puyu dan untuk pemanfaatan limbah cair tahu 100 % untuk larva ikan puyu tidak bisa dalam jangka panjang.

Kata Kunci: Ikan puyu, Limbah cair tahu, Sintasan

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INTRODUCTION

Environmental pollution results from community activities, including those in the industrial sector, that produce various necessary products. In Indonesia, there are many tofu industries in every city. Tofu industry waste can be solid and liquid. Solid waste is produced from the filtering process, and the clotting process is usually utilized as animal feed. In contrast, liquid waste is produced from the washing, boiling, pressing, and pressing of tofu (Sayow et al., 2020).

Pradana et al. (2018) state that tofu liquid waste is usually discharged directly into rivers, sewers, or water bodies without prior processing. Tofu liquid waste generated for each processing of one quintal of tofu is 1.5-3m^3 (Disyamto et al. 2014). Tofu liquid waste disposed of without a management process will cause water pollution by decreasing oxygen dissolved in water, so that organisms in the waters are disturbed, including those in the development process (Agung and Winata, 2013). Research on the effect of tofu liquid waste on the hatchability of eggs in fish has been widely conducted. However, research has examined the effect of various concentrations of tofu liquid waste on the mortality of climbing perch eggs *(Anabas testudineus*).

Several studies have shown the effect of different temperature treatments on the hatching time, egg hatchability, and survival rate of brush-mouth albino fish larvae *(Ancistrus cirrhosus*) (Yuliani et al., 2020). Rahmi et al. (2016), optimization of different doses on hatching rate and survival in dumbo catfish *(Clarias gariepinus* Burchell.) eggs treated with meniran (*Phillanthus niruri*) extract (Murni et al., 2015), the effect of kersen *(Muntingia calabura*) leaf extract with different doses on incubation time, hatchability and survival of dumbo catfish larvae (*Clarias gariepinus* Burchell.) (Mulyani and Johan, 2020).

Although there have been many studies on factors that affect the hatching of fish eggs, no research has focused on the effect of tofu liquid waste on the mortality of tambakan eggs *(Helostoma temincki*). The results of this study can be utilized as a reference source for researchers, namely on environmental / climate change and waste recycling. Based on the above background, it is necessary to research "The Effect of Tofu Liquid Waste Concentration on Egg Hatching Rate and Survival Climbing Perch *(Anabas testudineus*)."

MATERIALS AND METHOD

Materials

The test eggs used in the study were 50 climbing perch eggs per research container, a total of 750 eggs. The eggs were obtained from the spawning of climbing perch parents at the Fish Seed Center, Faculty of Agriculture, Islamic University of Riau.

Method

This study used a completely randomized design (CRD) with four treatments and three replicates. The treatments used are as follows:

P0 : Control
P1 : Tofu liquid waste concentration 25%
P2 : Tofu liquid waste concentration 50%
P3 : Tofu liquid waste concentration 75%
P4 : Tofu liquid waste concentration 100%

Container Preparation

This research begins with preparing the research container, where the container is a 10 L volume jar totalling 15 pieces. Before being arranged, the containers were cleaned/washed first to remove the dirt inside. After cleaning, the container was arranged on the research table and randomized according to treatment. The research container was filled with 4 L of water and added to the concentration of tofu liquid waste in each container at the beginning of the study. In addition to the jar, another container used was a 10 L jar, which was also used as a sample fish container equipped with aeration.

In this study, the media used water from the borehole. The water is put into a jar equipped with aeration and precipitated first before being used as a medium for raising adapted test fish. Then, the water from the borehole is put into a spare tub. Another medium used is tofu liquid waste. Before being mixed into the water, the tofu liquid waste is first measured according to the concentration that has been calculated and then mixed into the research container.

Test Egg

The next step is to prepare the test eggs. To get the test fish eggs, the first thing to do is to spawn the climbing perch broodstock artificially. Before being spawned, the climbing perch broodstock was satiated first, and the number of female broodstock used was two fish and one male. The climbing perch broodstock came from the enlargement pond.

Artificial spawning is done by injecting the hormone ovaprim into the climbing perch broodstock. The injection dose used in the female parent is 0.3 cc and in the male parent 0.2 cc. The injection is done at night, while the stripping process is done during the day. After spawning, the egg incubation is carried out for one day. Furthermore, the spawned quail fish eggs were taken to be placed in the research container first. The number of eggs placed in the research container is 50 eggs/research jar, and then the research is carried out.

Data Analysis

In this study, the data observed was the mortality of quail eggs and the water quality, which was thought to be affected. The data obtained are presented as tables and histograms to facilitate conclusion. Furthermore, data from the study's results were analyzed using ANOVA (variance) Sudjana (1992). If the ANOVA results show the Fcount < Ftable at the 95% level, then there is no treatment effect, and if the Fcount > Ftable is at the 99% level, then the treatment has a very real effect.

RESULT AND DISCUSSION

Hatchability of Climbing perch eggs

Climbing perch fish is a fish that is very resistant to the treatment given.

Table 1. Average percentage of hatching rate of Climbing perch eggs *(A. testudineus)*

Treatment	Egg hatchability		Hatching rate (%)
	Initial	End	
P0	50	7	42,00
P1	50	7	44,00
P2	50	8	50,00
P3	50	9	54,00
P4	50	10	60,00

In Table 1, the average hatchability of climbing perch eggs for each treatment has a variety of percentage results, ranging from 42.00% to 60.00%. The best percentage in the treatment of P4 with a concentration of 100% tofu liquid waste produces a percentage of 60.00%, followed by P3 with a concentration of 75% tofu liquid waste produces a hatchability percentage of 54.00% then P2 of 50.00% with a concentration of 50% tofu liquid waste, P1 of 44.00% with a concentration of 25% tofu liquid waste and P0 treatment is the lowest treatment without giving the concentration of tofu liquid waste produces a percentage of 42.00%.

The average hatchability of climbing perch eggs is highest in the P4 treatment with a concentration of 100% tofu liquid waste, resulting in a percentage of 60.00%, and the P0 treatment has the lowest percentage of 42.00% without the provision of tofu liquid waste as a hatching medium. The hatchability of climbing perch eggs in the P4 treatment has the best percentage. This shows that the treatment with tofu liquid waste is a good enough concentration for the hatching process of climbing perch eggs. According to Joniawan (2022), tofu waste contains nutrients N 1.24%, P_2O_5 5.54%, K_2O 1.34%, and C-Organic 5.80% essential nutrients objects need. Tofu liquid waste has a composition of organic matter in the form of protein 40-60%, carbohydrates 25-50%, and fat 10%. Meanwhile, the pH of tofu wastewater also affects the hatching process of fish eggs, ranging from 6.5 to 7.5. According to Sitanggang et al. (2020), it is necessary to approach the ion concentration between eggs and the environment so that the energy used for the osmoregulation process can be maximized for embryonic development and can maintain embryonic survival.

Meanwhile, the P1, P2, and P3 treatments have a percentage of hatchability that is not too far away: P1 produces a percentage of 44.00%, P2 is 50.00%, and P3 is 54.00%. This is thought to be because some of the compounds contained in the concentration of tofu liquid waste can still be tolerated to work optimally enough for hatching climbing perch eggs. In addition, compounds other than essential nutrients contained in tofu liquid waste are thought to help in the hatching process of climbing perch eggs. This is because tofu liquid waste

contains several other compounds, such as proteins, fats, and carbohydrates (Joniawan, 2022). Meanwhile, according to Novita (2019), the proteins, fats, and carbohydrates present in tofu liquid waste directly act as additives to the hatching process that interfere with the work of these microorganisms.

Fertilized or unfertilized eggs will be difficult to distinguish at this stage. The fertilized egg will develop and undergo division into two cells 25-35 minutes after fertilization, continuing the next stage of division of 4, 8, 16, and 32 cells 2-2.5 hours after fertilization. After 32 cells, the egg enters the morula stage after 60 minutes. The next stage is the blastula after 3 - 4 hours, and the next stage is the early gastrula after 6 hours. At this stage, the degree of fertilization is calculated. The final gastrula stage occurs after 8 hours. Regular eggs are transparent about 12 hours after fertilization, while dead eggs become opaque (white). Different concentrations of tofu liquid waste obtained different results that are not significantly different in the hatchability of climbing perch eggs.

Survival rate of Climbing Perch Larvae

Climbing perch larvae are very vulnerable to the rearing process in fish farming.

Table 2. Average survival of climbing perch *(A. testudineus)*

Treatment	Amount of fish		Survival rate (%)
	initial	end	
P0	50	6	40,00
P1	50	7	46,00
P2	50	8	52,00
P3	50	9	58,00
P4	50	10	64,00

In Table 2, the lowest treatment at P0 without giving the concentration of tofu liquid waste has a percentage of 40.00%. Then, the best treatment in P4 has a percentage of 64.00% with a concentration of 100% tofu liquid waste. The lowest survival rate of climbing perch larvae was found in the P0 treatment. It is suspected that climbing perch larvae cannot adjust to the maintenance media and the water quality following the living climbing perch environment. According to Noprianto (2022), poor water quality due to low pH affects the structure of the gills and can affect the level of oxygen consumption. Changes in the structure of fish gills make the osmoregulation and excretion system in the fish body will be disrupted which can make the osmotic pressure of body fluids not ideal and will cause the rate of biosynthesis to be inhibited and ultimately disrupt the survival rate of the fish itself.

The percentage of survival increases along with the increasing concentrations of tofu liquid waste applied to the climbing perch eggs. There is a significant increase starting with the P0 treatment of 40.00%, followed by the P1 treatment of 46.00%, P2 treatment of 52.00%, P3 treatment of 58.00%, and the highest treatment in the P4 treatment of 64.00%. This proves that the provision of a large enough concentration of tofu liquid waste significantly impacts the survival of climbing perch larvae.

The lowest survival rate of climbing perch larvae was found in the P0 treatment without giving the concentration of tofu liquid waste. It is suspected that climbing perch larvae cannot adjust to the pH of the water that becomes the maintenance media. According to Noprianto (2022), maintenance media where the pH is low affects the gills' structure, which can affect the oxygen consumption level. Changes in the structure of fish gills make the osmoregulation and excretion system in the fish body will be disrupted which can make the osmotic pressure of body fluids not ideal and will cause the rate of biosynthesis to be inhibited and ultimately disrupt the survival rate and growth of fish.

In addition, it causes stress when climbing perch larvae. Stress in fish larvae can cause reduced fish appetite, passive fish movements, and paler body color. Stress is a physiological response that occurs when fish try to maintain their body condition from the surrounding environment or the disturbance of other organisms (Rasti, 2017). This shows that the need for protein, fat, carbohydrates, and the presence of good bacteria from fermenting tofu liquid waste is sufficient, according to the needs of fish for growth. The high and low content of protein and nutrients in tofu liquid waste is optimum for feed needs influenced by sufficient fat and carbohydrates. Without sufficient carbohydrates and fats, fish depend on their energy, mainly from feed protein, which is used as an energy source to digest food and perform metabolic processes (Diki, 2018).

Water Quality

The supporting parameters of this study are water quality parameters, namely temperature and pH. Water as a living medium kept fish must meet the requirements. Water quality must be controlled to remain in optimal conditions, thus creating an environment suitable for climbing perch habitats. Temperature is an environmental factor that affects the speed of metabolism of the fish body. During this study, the temperature was recorded between 24-27^{o}C.

This follows Khairuman and Amri (2003), who stated that the optimal water temperature for climbing perch is 25-30^{o}C. Temperature can affect the life activities of organisms, such as fish appetite (Mulyani and Johan, 2014). If the temperature increases, fish will increase food intake, and the decrease in temperature causes the digestive and metabolic processes to run slowly (Effendie, 2003).

CONCLUSION

Concentration of tofu liquid waste on hatchability and survival of climbing perch (*A. testudineus*). The concentration of 100% tofu liquid waste produces the highest survival rate of P4 treatment (64.00%) and the lowest without giving the concentration of tofu liquid waste P0 (40.00%). The concentration of 100% tofu liquid waste produces the highest hatchability of P4 treatment by (60.00%) and the lowest without giving the concentration of tofu liquid waste at P0 by (42.00%).

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