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THE EFFECT OF SOAKING IN KETAPANG LEAVES ON THE PRODUCTIVITY PERFORMANCE AND COLOR QUALITY OF ZEBRA FISH (*Danio rario*)

Pengaruh Perendaman Daun Ketapang Terhadap Performa Produktivitas dan Kualitas Warna Ikan Zebra (*Danio rario)*

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ABSTRACT

Zebra fish (*Danio rerio*) is a widely cultivated ornamental freshwater species valued for its distinctive body stripes. However, color fading during the rearing period remains a common problem for fish farmers. Ketapang leaves (Terminalia catappa) contain various bioactive compounds, including tannins, flavonoids, and saponins, which are known to improve fish health and potentially enhance pigmentation. This study aimed to determine the effect of ketapang leaf soaking water on the improvement of color quality in Zebra fish (Danio rerio). The research was conducted for 28 days using a Completely Randomized Design (CRD) with five treatments and three replications: A (control/100% freshwater), B (25% ketapang leaf extract), C (50%), D (75%), and E (100%). The observed parameters included survival rate, absolute length growth, absolute weight growth, color quality, and water quality (pH, DO, and temperature). Color quality was assessed using visual color grading and evaluation by 50 panelists. The results indicated that the use of ketapang leaf soaking water significantly influenced the enhancement of color quality in Zebra fish. Treatment D (75% ketapang leaf soaking water) produced the highest color brightness score, both visually and based on panelist assessments. The highest survival rate was recorded in treatment E (100%), while the highest weight growth occurred in treatment A (control). Water quality parameters, including pH, DO, and temperature, remained within optimal ranges for Zebra fish culture throughout the study.
Keywords: Danio rerio, Ketapang leaf, Color quality, Ornamental fish, Pigmentation,

ABSTRAK

Ikan Zebra (*Danio rerio*) merupakan salah satu ikan hias air tawar yang digemari karena pola garis tubuhnya yang menarik. Namun, pemudaran warna selama masa pemeliharaan menjadi salah satu kendala yang sering dihadapi pembudidaya. Daun ketapang (*Terminalia catappa*) dikenal mengandung senyawa bioaktif seperti tanin, flavonoid, dan saponin yang berpotensi

meningkatkan kesehatan ikan serta memengaruhi intensitas warna. Penelitian ini bertujuan untuk mengetahui pengaruh penggunaan air rendaman daun ketapang terhadap peningkatan kualitas warna ikan Zebra. Penelitian dilakukan selama 28 hari menggunakan Rancangan Acak Lengkap (RAL) dengan lima perlakuan dan tiga ulangan, yaitu: perlakuan A (kontrol/100% air tawar), B (25% air rendaman daun ketapang), C (50%), D (75%), dan E (100%). Parameter yang diamati meliputi tingkat kelangsungan hidup, pertumbuhan panjang mutlak, pertumbuhan bobot mutlak, kualitas warna, serta kualitas air (pH, DO, suhu). Penilaian kualitas warna dilakukan menggunakan gradasi visual dan penilaian panelis sebanyak 50 orang. Hasil penelitian menunjukkan bahwa penggunaan air rendaman daun ketapang memberikan pengaruh terhadap peningkatan kualitas warna ikan Zebra. Perlakuan D (75% air rendaman daun ketapang) menghasilkan skor kecerahan warna tertinggi, baik pada pengamatan visual maupun penilaian panelis. Tingkat kelangsungan hidup tertinggi diperoleh pada perlakuan E (100%), sedangkan pertumbuhan bobot tertinggi terdapat pada perlakuan A (kontrol). Nilai pH, DO, dan suhu selama penelitian berada pada kisaran optimal untuk pemeliharaan ikan Zebra.

Kata Kunci: Danio rario, Daun ketapang, Kualitas warna, Ikan hias, Pigmentasi,

INTRODUCTION

Sorong City, Southwest Papua, is one of the areas where several ornamental fish farmers cultivate various types, one of which is the zebra fish (*Danio rario*). Zebra fish (*Danio rario*) is a relatively new type of ornamental fish in Sorong and its surroundings, but interest in this type of ornamental fish is quite high, as evidenced by the many sellers of this type of ornamental fish found in Sorong City. According to Soedarto (2024), one of the attractions of zebra fish is the color on the body, which affects the selling price of zebra fish. The main obstacle often faced by cultivators and ornamental fish enthusiasts is the fading of the fish's color when kept for a long time in ponds or aquariums (Lesmana, 2002). Moving from this problem, research is needed to overcome this problem, namely the fading of the color quality of zebra ornamental fish (*Danio rario*). Several previous studies that have been conducted are known that the effect of adding carrot extract (*Daucus carota*) in feed to improve the color of goldfish (*Carassius auratus*) (Diansyah Amin & Yulisman, 2019), then research conducted by Haq, (2022) namely the addition of ketapang leaves to improve the color quality of Guppy fish (*Poecilia reticulata*). while previous research has also been conducted on the color quality and production performance of red molly fish (*Poecilia sphenops*) with the addition of ketapang leaves (Terminalia catappa) in the maintenance media conducted by Citra Amandhan *et.al*, (2023) Another solution that can be applied is through environmental engineering cultivation using water soaked in ketapang leaves.

Zebrafish (*Danio rario*) is an ornamental fish originating from Nepal, Pakistan, and Bangladesh (Pratama, 2021). Because it has a unique color pattern, it makes ornamental fish much sought after among ornamental fish lovers. In addition, the body of this fish is decorated with horizontal blue-black stripes, which provides a special attraction for ornamental fish lovers (Soedarto, 2024). In general, zebrafish (*Danio rario*) have a body length of about 2 to 5 cm. The base color tends to be golden white, while the pattern of stripes that crosses its body appears bluish black, adding to the visual beauty of this fish (Akbar *et.al*. 2021).

Ketapang leaves, also known as Terminalia catappa, have natural substances such as alkaloids, flavonoids, saponins, triterpenoids, steroids, and tannins. Phytochemical content. The bark, stems and leaves of ketapang are utilized because the phytochemical compounds in

them function as natural medicine. (Hnawia *et al*. 2011). Ketapang leaves not only function as medicine, but are also able to brighten the color of fish, research conducted by Amandhani *et al* 2024 on the color quality of molly meirah fish (*poeicilia spheinops*) with the addition of ketapang leaves can have an effect on the brightness of the color. Ketapang leaves are also able to prevent fish from being attacked by diseases such as fungus. The use of ketapang leaf soaking water has been widely used by several popular fish such as channa fish (*Channa striata*), koi fish (*Cyprinus rubrofuscus*) and betta fish (Betta splendens) etc. According to Chansau and Assawawongkasem (2011), extracted ketapang leaves have the ability to regenerate fish fins and tails quickly.

RESEARCH METHODS

Time and Place of Research

The research was conducted in May–June 2025 at the Aquaculture Laboratory of Muhammadiyah University of Education, Sorong. Water quality analysis was conducted at the Integrated Laboratory of UNIMUDA Sorong. The experimental design used in this study was a Completely Randomized Design (CRD) method with 5 treatments and 3 replications, as follows:

Treatment A: Without soaking
Treatment B: Soaking in 25% ketapang leaf water
Treatment C: Soaking in 50% ketapang leaf water
Treatment D: Soaking in 75% ketapang leaf water
Treatment E: Soaking in 100% ketapang leaf water

Tools and Materials

Tools and materials used in this research, Tools and materials used to support this research are, digital scales, fish nets, aquariums, DSLR cameras, measuring cups, thermometers, DO meters, pH meters. The research materials used are Zebra fish, ornamental fish food, ketapang leaves and fresh water.

Research Procedures

The research procedures used in this study consist of container preparation, test material preparation, fish maintenance, data collection, and data processing.

Container Preparation

The containers used for maintenance are 15 glass aquariums measuring (25x25x25) cm. The glass aquariums are cleaned first, then each aquarium is filled with 10 L of water.

Preparation of Test Materials

The Zebrafish used were cultivated by farmers in Sorong City, measuring 3-5 cm and totaling 150 fish. The material used in the study was 51 grams of dried ketapang leaves. The ketapang leaves were washed thoroughly, then rinsed with running water. The clean ketapang leaves were dried in the sun until completely dry. The dried ketapang leaves were weighed according to research procedures, then soaked in 10 L of fresh water. Ten test fish were stocked in the test container for each treatment (Haq, 2022).

Maintenance of Test Animals

Zebrafish were kept in an aquarium for 28 days. The test animals were fed commercial feed at the station. Feeding times were twice daily: at 8:00 AM and 4:00 PM WIT.

Water Quality Measurement

Water quality measurements were carried out at the beginning and end of the study. The measurements were temperature, pH, and (DO) measured once a day for 28 days.

Data Analysis

The data obtained in the study were processed with the help of Microsoft Excel 2011. Data analysis was carried out using variance (ANOVA) and also using SPSS version 22.0. If a significant difference is found, further testing will be carried out using the Duncan Test.

Test Parameters

Survival Rate

The survival rate is the ratio between the number of fish alive at the end of the study and the number of fish alive at the beginning of the study. The formula for calculating the fish survival rate is as follows (Goddard 1996)

$$\mathbf{TKH} = \frac{Nt}{No} \mathbf{x\ 100}$$

Information:

TKH : Survival rate (%)

Nt : Number of fish at the end of maintenance

No. : Number of fish at the beginning of maintenance

Absolute Length Measurement

Total length measurements include the total length of the fish from the tip of the mouth to the tip of the tail. Fish length measurements are taken using a modified ruler with a centimeter scale. The length calculation is carried out using Effendi's (1979) formula in Barus (2014), namely:

$$P_m = P_t - P_0$$

Description:

P_m : Absolute length growth of fish (cm)

P_t : Length of fish at time t (cm)

P_0 : Length of fish at time 0 (cm)

Absolute Weight Measurement

Fish weight measurements were taken using digital scales, fish weight gain was calculated using the Efeendi (1979) formula in Barus (2014), namely:

$$W_m = W_t - W_0$$

Information:

W_m : Absolute weight gain of fish (g)

W_t : Fish weight at time t (g)

W_0 : Fish weight at time 0 (g)

Color Quality Analysis

Color quality analysis was conducted using photo documentation with a DSLR camera. The image capture process was carried out with special settings so that the resulting photos could accurately represent the condition of the fish. Each treatment was made three sample photos with three repetitions. The photos were then analyzed using Adobe Photoshop software as was done on the image of amandhani et al (2023) as in Figure 1.

Figure 1. Color Gradation of Zebrafish (*Danio Rerio*)
Source: (Asrul, 2025)

RESULT

The results showed that the use of water soaked in ketapang leaves had a positive effect on the color quality of Zebra fish (Danio rerio), with the best treatment obtained at a concentration of 75% which produced the highest level of color brightness based on visual observation and panelist assessment. The survival rate of fish in all treatments was high and above 80%, with the highest value in the treatment of 100% water soaked in ketapang leaves, although statistically there was no significant difference between treatments. The absolute length growth of fish did not show a significant difference, while the highest absolute weight growth was obtained in the control treatment (100% fresh water). During the study, water quality parameters such as pH, dissolved oxygen, and temperature were within the optimal range, thus supporting the survival and performance of Zebra fish during the maintenance period.

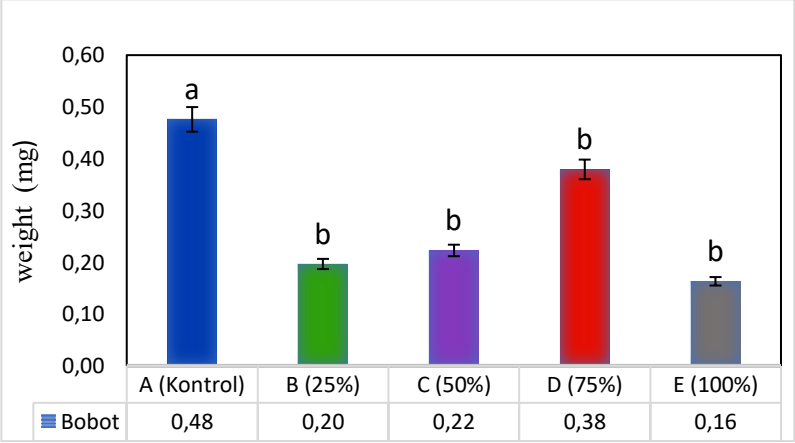

Figure 2 Absolute Weight Growth Graph

Figure 3 Survival Rate Graph

Figure 4 Absolute Length Growth Graph

The results of the color quality showed that the application of water soaked in ketapang leaves had an effect on increasing the color brightness of Zebrafish (*Danio rerio*). The best treatment was obtained at a concentration of 75% water soaked in ketapang leaves which produced the brightest color based on visual observation and panelist assessment. Treatments with lower concentrations showed a moderate increase in color, while the use of 100% water soaked in ketapang leaves resulted in lower color brightness. This indicates that the right concentration of water soaked in ketapang leaves plays an important role in improving the color quality of Zebrafish.

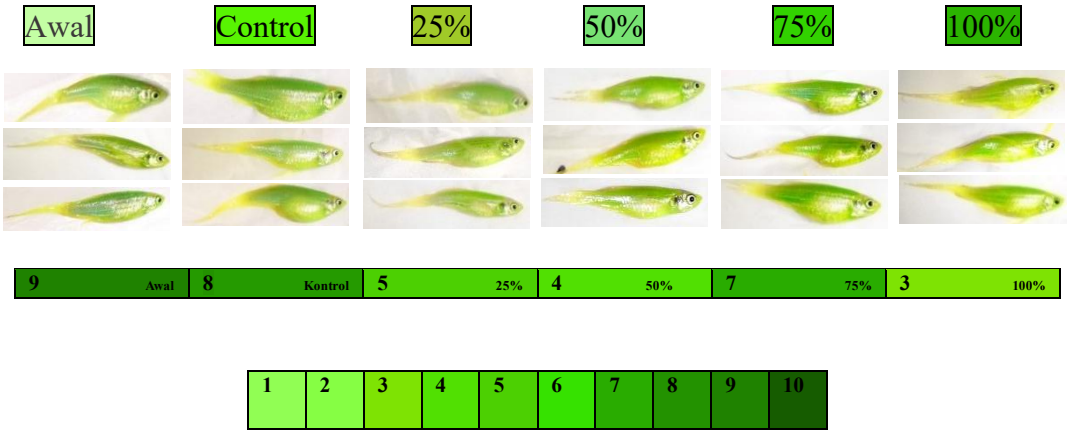

Figure 5 Color Quality of Zebra Fish *Danio Rario*

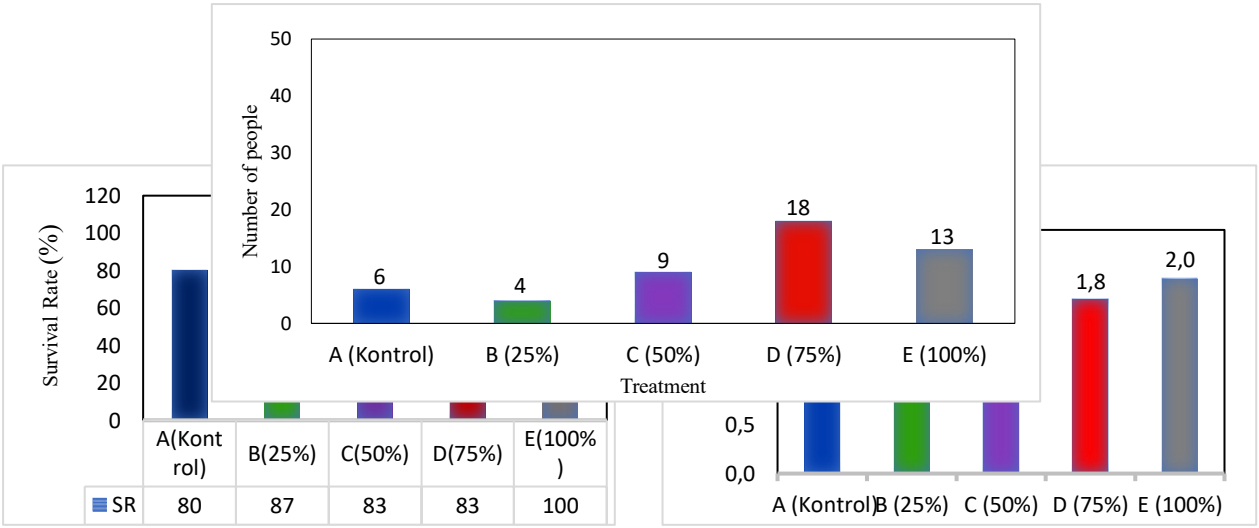

Figure 6 Percentage of Fish Color Quality Assessment

Water quality measurements during the study showed that pH, dissolved oxygen (DO), and water temperature were within the optimal range for Zebrafish (Danio rerio) maintenance. The pH ranged from 8.18–8.68, DO levels between 5.04–5.96 mg/L, and water temperature between 27–29°C. These stable and suitable water quality conditions support the survival, growth, and color quality of the fish during the maintenance period.

	Treatment					
Parameter	**Control**	**25%**	**50%**	**75%**	**100%**	**Library**
pH	8,50-8,90	8,67-8,90	8,67-9,10	8,57-8,90	8,63-8,90	Bachtiar (2002),
Temperature	25,3-28,7	25,2-28,7	25,1-29,0	25,1-28,9	25,2-29,0	Jele et al., (2023)
DO	3,60-6,73	3,13-6,73	3,60-6,53	3,57-6,43	3,10-6,47	Bachtiar, (2002)

DISCUSSION

Fish growth is the result of physiological processes influenced by nutrient availability, environmental conditions, and the fish's ability to utilize energy from the feed consumed. Growth can be observed through increases in fish length and body weight during the rearing period (Brett & Groves, 1979; Weatherley & Gill, 1987). Although not statistically significantly different, the tendency for increased survival rates in treatments with higher concentrations of ketapang leaves indicates a positive effect on fish health. The results showed that the survival rate (SVR) of zebrafish during 28 days of rearing was in the range of 80–100%. The highest value was obtained in treatment E (100% ketapang leaf-soaked water), while the lowest value was found in treatment A (control, 100% fresh water).

The high survival rate in the treatment with the addition of water soaked in ketapang leaves is thought to be related to the content of bioactive compounds in ketapang leaves, such as tannins, flavonoids, saponins, and alkaloids, which have antibacterial and antifungal properties (Hnawia *et al*., 2011). These compounds play a role in suppressing the growth of pathogenic microorganisms in the rearing medium, thereby increasing the fish's immune system. These results align with research by Chansue and Assawawongkasem (2011) which stated that ketapang leaf extract can improve the health of ornamental fish and accelerate the wound healing process and fin regeneration. Furthermore, Rizal *et al*. (2021) reported that the use of herbal ingredients in rearing media can increase fish immunity and reduce stress levels.

According to Mulyani *et al*. (2014), a fish survival rate above 50% is considered good, so all treatments in this study are still considered feasible and safe for zebrafish cultivation. Based on the analysis results, the highest absolute length growth of zebrafish was obtained in treatment E (100% ketapang leaf-soaked water), while the lowest was in treatment C (50% ketapang leaf-soaked water). However, the ANOVA test results showed that the difference in treatment did not have a significant effect on the absolute length growth of zebrafish. The insignificant effect of treatment on length growth is thought to be because the main factor in fish length growth is more influenced by nutritional intake, especially protein content in the feed, compared to the condition of the maintenance media (Anggraeni & Abdulgani, 2013). In addition, zebrafish have a relatively fast growth pattern in the initial phase, but can slow down if the energy obtained is used more for environmental adaptation (Fidyandini *et al*., 2016).

The highest absolute weight gain was found in treatment A (control), while the lowest was found in treatment E (100% ketapang leaf-soaked water). Statistical analysis showed that the ketapang leaf-soaked water treatment significantly affected the absolute weight gain of zebrafish. The low absolute weight gain in the treatment with a high concentration of ketapang leaves is thought to be caused by a decrease in fish appetite due to changes in the color and characteristics of the water, which are darker, and a relatively high tannin content. Tannins are known to affect feed palatability and nutrient absorption efficiency (Sunarto & Sabariah, 2009). According to Effendi (1997), fish weight gain is greatly influenced by the balance between energy used for body maintenance and energy for growth. If most of the energy is used for environmental adaptation, then weight gain will be lower.

Color quality

The body color of ornamental fish is one of the main factors that determine the aesthetic value and selling value. Fish color is produced by chromatophore cells found in the dermis layer of fish skin (Ahlihan *et al*., 2008). At too high a concentration (100%), the color of the fish actually experiences a decrease in brightness, which is thought to be due to environmental conditions that are too dark, thus inhibiting color reflection on the fish's body. The results of the study showed that the best color quality visually and based on panelist assessments was obtained in treatment D (75% ketapang leaf soaking water). This condition indicates that the optimal concentration of ketapang leaf soaking water is able to increase the color intensity of zebrafish.

Water soaked in ketapang leaves contains tannins that can create water conditions resembling the natural habitat of zebrafish. An environment that approximates the natural habitat can reduce stress and increase the expression of color pigments in fish (Costa, 2009). This is in line with Novita *et al*. (2019), who stated that fish color will be more stable and bright if the fish are kept in an environment that suits their physiological needs. However, at a 100% concentration of ketapang leaf-soaked water, color quality actually decreases. This is thought to be because water conditions that are too dark can inhibit light reflection on the surface of the fish's body, making the color appear duller (Said *et al*., 2005).

Water Quality

During the study, the water pH ranged from 8.18 to 8.68. This range is considered suitable for zebrafish cultivation. According to Bachtiar (2002), the optimal pH for ornamental fish ranges from 6 to 9. The pH plays an important role in controlling chemical reactions in the water. pH conditions that are too acidic or alkaline can cause physiological stress in fish and disrupt metabolic processes. Changes in pH during the study are thought to be influenced by the accumulation of leftover feed and metabolites in the form of fish waste in the culture medium (Yufika *et al*., 2014). Dissolved oxygen (DO) levels during the study ranged from 5.04 to 5.96 mg/L. This value is still within the optimal limits for freshwater ornamental fish. Bachtiar (2002) states that a good DO level for ornamental fish ranges from 5 to 7 mg/L.

The water temperature during the study was in the range of 28.0–29.3°C. This temperature range is still optimal for the growth and color quality of zebrafish. According to Jele *et al*. (2023), a temperature of 27–29°C is the best temperature for producing bright zebrafish colors. Zebrafish belong to the Cyprinidae family, which has a fairly wide temperature tolerance and is able to adapt well to tropical water temperatures (Hernandez, 2002).

CONCLUSION

Based on the results of research on the effect of soaking ketapang leaves on the productivity performance and color quality of zebrafish (Danio rerio), it can be concluded that the use of ketapang leaf soaked water affects the survival rate, growth, and color quality of fish. The highest survival rate was obtained in the 100% ketapang leaf soaked water treatment, while the highest absolute weight growth occurred in the control treatment (100% fresh water). The best absolute length growth was obtained in the 100% ketapang leaf soaked water treatment, although statistically there was no significant difference between treatments. The best color quality of zebrafish was obtained in the 75% ketapang leaf soaked water treatment, which was also the treatment most preferred by panelists. Thus, the use of ketapang leaf soaked water at certain concentrations can be a natural alternative in improving the color quality and survival of zebrafish in cultivation activities.

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