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Variety of Tank Colours to Enhance the Colour Quality of Platyfish (*Xyphophorus helleri*)

Ina Oktaviani[1], Muhammad Junaidi[1]*, Bagus Dwi Hari Setyono[1]
[1] Department of Fisheries and Marine Science, Mataram University, Mataram, Indonesia

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*Corresponding Author:
Muhammad Junaidi,
Department of Fisheries and Marine Science, Mataram University, Mataram, Indonesia

Email: m.junaidi@unram.ac.id

Abstract: One of the factors that affect the colour quality of the platyfish (*Xyphophorus helleri*) during cultivation is the environment in bright light conditions, where setting bright light conditions can be done using a tank with a colour that can absorb light. Therefore, a study was conducted to examine the effect of tank colour on improving the colour quality of the platy fish and determining the correct tank colour. This research was conducted with an experimental method using a completely randomized design (CRD) consisting of five treatments repeated three times. The colour treatments of the tanks used were white, black, red, orange and yellow. The parameters observed were the increase in colour, growth in absolute weight and length and survival rate of platy fish. The results showed that the use of different tank colours had a significant effect ($p < 0.05\%$) on the improvement of colour quality and growth in absolute weight, and had no significant effect ($p > 0.05$) on absolute length growth and survival rate. The highest increase in colour quality was in white tanks with brightness values ranging from 13-15% and absolute weight growth ranging from 0.21 to 0.25 g. Therefore, in the cultivation of platy fish, a white tank should be used.

Keywords: platyfish; tank color; brightness; growth, survival rate

Introduction

The sword platy fish or platyfish (Xiphophorus helleri) is one type of ornamental fish that is in great demand for hobbies and ornamental fish cultivators. This freshwater ornamental fish is not native to Indonesia (Sugianti *et al*., 2014), but comes from Central America (Parawangsa *et al*., 2019; Sugianti *et al*., 2014). In addition to having an attractive color and a unique shape because in male fish there is a long dorsal fin that resembles a sword (Irawan, 2017; Islama & Nisa, 2017; Putra et al., 2020; Putri *et al*., 2018), this fish is easy to maintain and bred because it is very adaptable and has good tolerance in various environmental conditions. This fish is also highly social and not aggressive so that it can coexist with other ornamental fish in the aquarium (Islama & Nisa, 2017).

The price of the platyfish in the market ranges from Rp. 3,000 - Rp. 10,000 per head (Irawan, 2017). The price of ornamental fish is determined by the performance and uniqueness displayed through the beauty of the body shape or color scheme, so that ornamental fish is in great demand by all people. The uniqueness of the shape of the male platyfish causes the price to be higher than that of the female, and the higher the color brightness of the sword platy fish, the higher the price (Fahriza *et al*., 2017). Thus hobbyists and platyfish cultivators will try to maintain the brightness of this color. The problem that occurs in platyfish cultivation is the brightness of the color that is less attractive because of the low knowledge of cultivators about good platy fish cultivation technology.

According to Pratama *et al*. (2018) in general, the cultivation of ornamental fish enlargement is carried out in containers that have a dark color, causing the expression of the color intensity of ornamental fish to be less visible. Ornamental fish that are kept in bright conditions will give different color reactions from fish that are kept in dark conditions because of the different reactions of melanosomes containing melanophore pigments to light stimuli. Bright light conditions give a better color appearance than dark light because in bright light conditions the melanophores become concentrated around the nucleus, cells appear wrinkled and make fish skin appear brighter (Said *et al*., 2005).

One of the efforts that can be made to improve the color quality of the platy fish during rearing is by using a rearing container with bright light conditions. Adjusting the light conditions of the rearing container can be done

by using an aquarium covered with different colored paper (El-Sayed & El-Ghobashy, 2011; Pratama *et al*., 2018), or a container that already has a different color as needed, or a container that is painted using spray paint)) (Zulfikar *et al*., 2018). Therefore, a study was carried out with the aim of examining the effect of the color of the rearing on improving the color quality of the platyfish (*Xyphophorus helleri*) and determining the appropriate color of the rearing vessel to improve the color quality in the development of platyfish cultivation.

Materials and Methods

This research was conducted from September to October 2019 in Private Installation. Lingkungan Irigasi Taman Sari, Mataram City, West Nusa Tenggara Province.

Materials and Tools

The materials used in this study were test fish, namely platyfish larvae (*Xyphophorus helleri*) (Figure 1), dry silk worms (Tubifex) and fresh water media. While the equipment used includes maintenance tank in the form of containers measuring 39x26x14.5 cm^3 which have been painted with colors according to the treatment as many as 15 pieces, aerators for oxygen supply, cameras, water quality measurement equipment, namely thermometers, pH meters, and DO meters, scales and a ruler.

Experimental design

The experimental design used in this study was a completely randomized design (CRD) with three replications. The treatment studied was the use of platyfish rearing tank with different colors consisting of five levels, namely white (A), black (B), red (C), orange (D) and yellow (E).

Tank treatment and cultivation period

The tank used is a container tub with a volume capacity of ± 5 L of 15 units. Before use, the container is painted in the colors according to the treatment, namely white, black, red, orange and yellow, after the paint is dry washed and dried. Furthermore, the container tanks were placed randomly (Figure 2) and each filled with 4 liters of fresh water and an aerator. The spread of sword platy fish is carried out in the morning with a density of 8 fish per good (2 fish / L). Maintenance was carried out for 45 days, during which the maintenance was fed with dry silk worms in the morning and evening at a rate of 5%. To maintain water quality in accordance with the needs of sword platy fish maintenance, the remaining feed and fish fecel are piped and measured the water quality every 15 days. The parameters observed were water temperature, oxygen solubility (desolved oxygen = DO) and water pH.

Fig 1. Platyfish (*Xyphophorus helleri*)

A1	D3	C1	B3	E2
B2	A2	E3	C2	D1
E1	C3	D2	A3	B1

Fig 2. The layout of the cultivation container

Data analysis

The parameters observed in this study were color quality, length and weight growth, survival and water quality. The difference in the color quality of the platyfish was analyzed based on the HSB color digital model (*Hue, Saturation, Brighness*) (Kusumah *et al*, 2015; Kusumah *et al*., 2011). Measurement of the digital value of the color of the platyfish is done by taking a sample of the fish and putting it in a clean measuring cup, then the glass containing the fish is placed on a flat place and makes it easy to photograph. Photographs were carried out at the same place, time and lighting, namely during the day. Digital measurements of brighness (B) were carried out at the beginning and end of the study to determine the color change. Then the results of taking pictures of platyfish samples were applied to the Adobe Photoshop 2014 computer software. Calculation of color change (Cm) in fish with the formula according to Putri *et al*. (2018) namely PW (%) = Ct - Co, where Ct is the final color value and Co is the initial color value of the study.

The growth of absolute length (Lm) is calculated by the formula according to Roundseferll and Everhart (1962) in Putri *et al*. (2018), namely Lm (cm) = Lt - Lo, where Lt is the length of the fish at the end of the study and Lo is the length of the fish at the beginning of the study. The growth og ablosulte weight (Wm) is calculated by the formula according to Effendie (1979) in Putri *et al.* (2018) namely Wm (g) = Wt - Wo, where Wt is the weight of the fish at the end of the study and Wo is the weight of the fish at the beginning of the study. Survival rate (SR) is calculated by the formula according to Islama & Nisa (2017), namely SR (%) = Nt / No x 100%, where Nt is the number of fish at the end of the study and No is

the number of fish at the beginning of the study. The sampling technique and water quality observation procedures refer to APHA (2005).

The data obtained were analyzed using analysis of variances (ANOVA) at the 95% confidence level (Raupong, 2017; Susilawati, 2015).If the ANOVA test shows a significant effect (P <0.05) on each treatment, then Duncan's multiple comparison test is carried out (Susilawati, 2015). Data processing and analysis was performed using excel 2013 software and SPSS version 16 for Window.

Results and Discussion

The Effect of The Color of The Rearing Tank on Color

The results of analysis of variance (Anova) the effect of the color of the rearing tank on color, absolute length growth (Lm), absolute weight growth (Wm) and survival (SR) of platyfish (*Xyphophorus helleri*) can be seen in Table 1.

Table 1. Anova of the various effects of the color of the rearing tank on color quality (Cm), absolute weigth growth (Wm), absolute length growth (Lm) and survival (SR) of platyfish

Parameters	Treatments				
	A (white)	B (black)	C (red)	D (oranye)	E (yellow)
Cm (%)^{s}	14,0 ± 1,00 $^{c*)}$	4,0 ± 1,00 ^{a}	4,7 ± 3,21 ^{a}	7,0 ± 4,58 ^{ab}	10,3 ± 1,53 ^{bc}
Wm (g)^{s}	0,23 ± 0,02 ^{d}	0,10 ± 0,04 ^{a}	0,15 ± 0,03 ^{b}	0,17 ± 0,02 ^{bc}	0,20 ± 0,02 ^{cd}
Lm (cm)^{ns}	0,61 ± 0,06	0,43 ± 0,05	0,46 ± 0,07	0,50 ± 0,08	0,53 ± 0,21
SR (%)^{ns}	100,00 ± 0,00	83,33 ± 7,22	87,50 ± 0,00	91,67 ± 7,22	95,83 ± 7,22

*) numbers followed by the same letter on the same line are non significant
ns = non significant; s = significant

Based on the analysis of variance, it was found that the use of different container colors had a significant effect (p <0.05%) on the increase in color quality and absolute weight growth (Wm), and had no significant effect (p> 0.05) on the absolute length growth (Lm) and survival (SR) (Table 1, Fig 3, 4, 5 and 6). The results of Duncan's multiple comparison test to determine the effect between treatments on increasing the color of platyfish (Table 1 and Figure 3), it was found that the treatment of white (A) rearing containers was significantly different from black (B), red (C) and orange (D) and not significantly different from the yellow maintenance container (E). The black rearing tank (B) was not significantly different from the red (C), orange (D) color and the yellow color (E) was significantly different.

The red rearing tank (C) was not significantly different from the orange color (D) and significantly different from the yellow color (E). The orange rearing tank (D) is not significantly different from the yellow color (E). The highest value increase in the color of the platyfish color was in the white rearing tank (A) of 14.0 ± 1.00% and the lowest was the black rearig tank (B), which was 4.0 ± 1.00% (Fig 3).

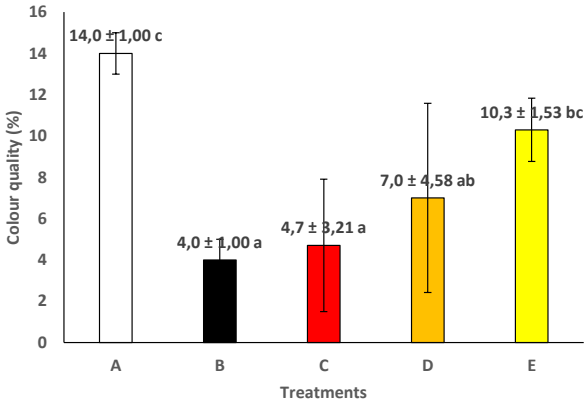

Figure 3. Improved color quality of platyfish during rearing with different colors of rearing tanks: A (white), B (black), C (red), D (orange), and E (yellow).

The results of Duncan's multiple comparison test to determine the effect between treatments on absolute weight growth (Table 1 and Figure 4), it was found that the treatment of white (A) rearing tanks was significantly different from black (B), red (C), orange (D). and not significantly different from yellow (E). The black color rearing tanks (B) is significantly different from the red (C), orange (D) and yellow (E) colors. The red rearing tank (C) is not significantly different from the orange color (D) and significantly different from the yellow color (E). The orange rearing tank (D) is not significantly different from the yellow color (E). The highest absolute weight growth value in the white rearing tank (A) was 0.23 ± 0.02 g and the lowest in the black rearing tank (B) was 0.10 ± 0.04 g (Figure 4).

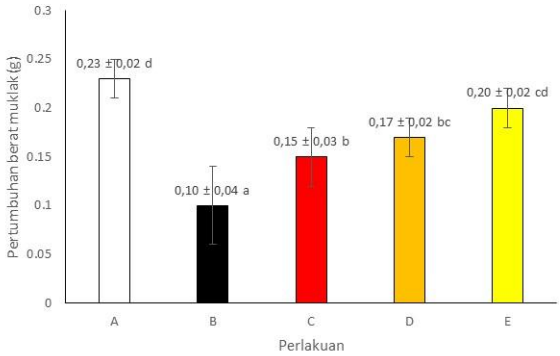

Figure 4. Absolute weigth growth of platyfish during rearing with different colors of rearing tanks: A (white), B (black), C (red), D (orange), and E (yellow).

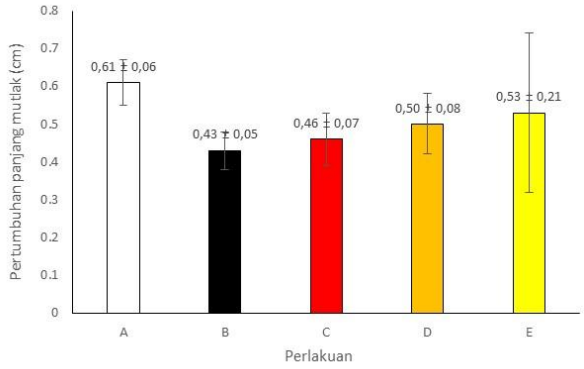

Figure 5. Absolute length growth of the platyfish during rearing with different colors of rearing tanks: A (white), B (black), C (red), D (orange), and E (yellow).

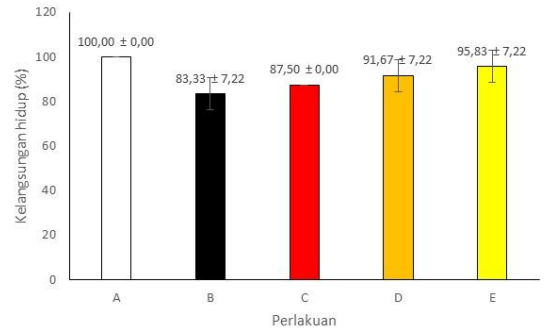

Figure 6. Survival rate of the platyfish during rearing with different colors of rearing tanks: A (white), B (black), C (red), D (orange), and E (yellow).

In keeping the platyfish (*Xyphophorus helleri*) for 45 days, the water quality results between water temperature ranges from 25.4 - 28.1 oC, oxygen solubility (DO) ranges from 5-8 mg/l, and pH ranges from 7, 0 - 7.9 (Table 2).

Table 2.The water quality values of the platyfish during rearing with different colors of the rearing tanks: A (white), B (black), C (red), D (orange), and E (yellow)

Parameters	Treatments					Quality Stand*)
	A	B	C	D	E	
Temp (°C)	26.9-28.1	26.5-27.8	25.4-28	27-29.7	26.3-28	23-29
DO (mg/l)	5-8	5-8	5-8	5-8	5-8	5-8
pH	7-7.5	7-7.9	7-7.9	7-8	7.2-7.8	6.5-8.5

Note *) Effendi (2012)

Color Quality

During rearing, the color quality of the platyfish experienced an increase in each treatment, where the best color quality was obtained in the white rearing tank (14.0 ± 1.00%), followed by yellow (10.3 ± 1.53%), orange (7.0 ± 4.58%), red (4.7 ± 3.21%), and the lowest was black rearing tank (4.0 ± 1.00%). Based on the analysis of variance, it was found that the use of different tank colors had a significant effect ($p < 0.05\%$) on improving the color quality of platyfish (Table 1 and Figure 3).

The color of the rearing tanks can provide a stimulus that triggers motivation and certain conditions in the fish, so that the color of the rearing tank affects the quality of the fish being cultivated, including growth, behavior, stress levels and reproduction (Nurhidayat *et al*., 2017). The high value of the color quality of the sword platy fish that is maintained in a white container compared to other colors, this is because the white color reflects all the light that falls on it and not a single one is absorbed so that the container has a bright background, while the black color absorbs all the elements of the light color and not one. is reflected, creating a dark background. This is supported by a statement from Pratama *et al*. (2018) stated that a container that reflects light has a better effect than a container that absorbs light in increasing the color of the fish due to differences in the location of the movement of pigment granules in the chromatophore cells to light stimulation. In bright light conditions the melanophores become concentrated around the nucleus, the cells appear wrinkled and make the fish skin look brighter so that fish reared in bright conditions will give different color reactions from fish kept in dark places due to differences in the reaction of melanosomes containing melanophore pigments against existing light stimuli (Said *et al*., 2005).

Color is an important commercial character that can affect the level of consumer acceptance of an animal product so that it also determines the selling value of the product in the market (Kusumah *et al*., 2011). In many ornamental fish species, for example the platyfish (*Xyphophorus helleri*), in addition to the unique shape of the dorsal fin that resembles a sword, color is known as a determining character for beauty, because the sword platy fish is one of the most colorful ornamental fish. According to Irawan (2017), the advantage of the sword platy lies in the orange color that blushes all parts of its body. This is what makes sword platy fish have a high enough selling value, so that many people are trying to get profit from the sale of these fish. The decline in the color quality of the sword platy fish will certainly have an impact on the selling price so that it will affect the income that will be obtained by sword plate fish businessmen, both cultivators and traders of sword plate fish themselves. In addition to the pigment content in feed (Putra *et al*., 2020; Said *et al*., 2005), the color change of ornamental fish is

influenced by the environment, in this case the maintenance container (Manullang, 2018; Pratama *et al*., 2018).

During the rearing of the color quality of the platyfish, there was an absolute weight growth in each treatment, where the best weight growth was obtained in the white rearing tank (0.23 ± 0.02 g), then followed by yellow (0.20 ± 0.02 g), orange (0.17 ± 0.02 g), red (0.15 ± 0.03 g), and the lowest was black rearing tank (0.10 ± 0.04 g). Based on the analysis of variance, it was found that the use of different container colors had a significant effect (p <0.05%) on the weight growth of platyfish (Table 1 and Figure 4). The high value of weight growth in sword platyfish kept in white tanks compared to other colors, this is because the white color produces bright and bright lighting so that the fish seeds can see the color of the food more clearly and provide high growth. According to Fitri (2005) and Fitri & Asriyanto (2009), the sharpness of fish vision depends on two factors, namely the diameter of the lens and the con-cell density of the retina. The diameter of the fish eye lens is directly proportional to the size of the body weight of the fish, which means that the heavier the fish's body, the fish eye lens diameter will increase. This happens because the diameter of the fish eye lens increases, resulting in an image of an object passing through the eye lens towards the retina will be faster, because the smallest angle of difference value is getting smaller. Therefore the treatment of white has a very good lighting for the platy sword's eye in finding and catching its food. According to Strand *et al*. (2007) high feed utilization in accordance with the needs of the reared fish will increase growth. The use of light color containers makes the feed more visible so that the consumption of fish will be higher than dark containers.

The best ini absolute length growth was obtained in a white rearing tank (0.61 ± 0.06 cm), followed by yellow (0.53 ± 0.21 cm), orange (0.50 ± 0.08 cm), red (0.46 ± 0.07 cm), and the lowest was black rearing tank (0.43 ± 0.05 cm). The white rearing tank provides bright and contrasting conditions so that the sword platy can easily see what is being fed. The results of the research on the effect of experimental color on survival and growth of seahorses showed that prey with high contrast had an eight times greater chance of being attacked than prey with low contrast (Sulistyanungrum, 2006), where white is a bright and attractive color resembling sunlight, with a wavelength high enough to reflect objects well into the fish's eye. Based on the analysis of variance, it was found that the use of different container colors did not have a significant effect (p> 0.05%) on the length growth of sword platy fish (Table 1 and Figure 5). The cultivation of sword platy fish with different container colors has no significant effect on length growth, it is assumed that the growth of sword platy is considered isometric, namely the weight gain is faster than the length of the fish (Effendie, 1979).

The best survival rate was obtained in a white rearing tank (100 ± 0.00%) cm), followed by yellow (95.83 ± 7.22%), orange (91.83 ± 7.22%), red (87.50 ± 0.00%), and the lowest was black raearing tank (83.33 ± 7.22%). Thus the survival of platyfish that are kept in tanks of various colors has a high survival rate (83.33 - 100%) and these fish are able to live in dark to bright water conditions, so that analysis of variance obtained that the use of different container colors. had no significant effect (p> 0.05%) on the survival of sword platy (Table 1 and Figure 6). According to Rachmawati *et al*. (2016) the survival rate of fish is influenced by internal factors which include sex, heredity, age, reproduction, disease resistance and external factors including water quality, stocking density, the number and composition of amino acids in the feed.

Water quality in the maintenance medium is one of the critical success factors in cultivation. In addition to measuring water quality, water supply and replacement are also carried out during maintenance to maintain water quality stability. Replacement of water with suction is done every day, while water changing is done every 15 days. Water quality measurements were carried out four times, namely before stocking, day 15, day 30 and day 45. Water quality parameters measured are oxygen solubility (DO), pH and temperature. The results of measuring water quality parameters in the maintenance media during the study (Table 2) indicate that the average value of the water quality parameters is feasible for the live medium of the platyfish (*Xiphophorus helleri*) (Effendi, 2012).

Conclusion

The use of different tanks colors had a significant effect on improving the quality of color and the absolute weight growth of the platyfish, however it did not have a significant effect on the absolute length growth and survival rate of platyfish. The highest color quality improvement is in white rearing tank with a brightness value between 13-15%, therefore in the rearing of platyfish, a white tanks should be used.

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