

EFFECT OF CARROT FLOUR (*Daucus carota L.*) ADDITION IN COMMERCIAL FEED ON THE COLOR BRIGHTNESS LEVEL OF MOLLY FISH (*Phocilia sphenops*)

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ABSTRACT

This study aims to examine the effect of differences in the addition of carrot flour on the color intensity of molly fish. The research was carried out from January 2022 to March 2022 at the Aquaculture Laboratory, Building 2, Faculty of Fisheries and Marine Sciences, Padjadjaran University. This study used an experimental method and the experimental design used in this study was a completely randomized design (CRD) with four treatments and three replications. The treatments were control, without carrot flour (A), 3% carrot flour (B), 5% carrot flour (C), and 7% carrot flour (D). Maintenance with treatment on the test fish was carried out for 40 days. Parameters observed included color brightness observed using Toca Color Finder (TCF), growth, viability and water quality (DO, pH, and temperature). The results showed that the highest increase in fish color brightness was obtained in treatment C with the addition of carrot flour by 5% with a value of 1.8 on the head and 1.7 on the body. The water quality parameter values in treatment C (5%) with temperatures ranging from 25.2 -26.3°C, DO (Dissolved Oxygen) 6.1-7.3 ppm, and pH 7.03-7.86 were in which is good for the growth and survival rate of molly fish.

Keyword : Molly Fish, Color Brightness, Toca Color Finder, Carrot Flour.

1. INTRODUCTION

Ornamental fish farming is a business that has high future prospects and provides promising benefits. According to BPS (2019), it shows that the export value of ornamental fish in 2018 reached USD 32.23 million, even in the first semester of 2019 the export value of ornamental fish had reached USD 16.54 million, an increase of 2.56% compared to 2018. One of that is molly fish. Molly fish have such a great attraction for Indonesian people today because of their brilliant and varied colors. Beautiful and brilliant colors in fish tend to be produced from several feeds that contain color pigments. The results of the research (Maolana et al. 2017), stated that the addition of carrot extract would have a very strong effect on the addition of the color intensity value of koi fish. While the results of Suci Rama Putri's research (2018) showed that the best treatment for improving color quality was takari + carrot pellets 2.5% + pumpkin 2.5%.

Based on some of the results of these studies, it can be stated that carrot flour can increase the color of ornamental fish like platy swordfish and koi fish. Empirically, when carrot flour can increase the brightness level of koi fish, this feeding treatment can be applied to molly fish. Different types of feed with the treatment of one type of fish can produce the same color brightness but also produce different color brightness. To the author's knowledge, research on the effect of carrot flour in artificial feed on the brightness level of the color of molly fish seeds has not been carried out. Therefore it is necessary to do research to determine the effect of adding carrot flour to commercial feed on the brightness level of molly fish.

2. MATERIALS AND METHOD

2.1 Experimental materials

The research was conducted from January 2021 to March 2022 at the Aquatic Animal Physiology Laboratory Building 2, Faculty of Fisheries and Marine Sciences, Padjadjaran University. The materials used in this study were: molly fish with a length of 2 - 3 cm as a test fish, Fengli pellets measuring between 0.7 - 1 mm as a test fish feed, Imperator carrot flour as an additional source of carotene, and Carboxymethyl cellulose (CMC) as adhesive/binder.

2.2 Experimental method

The research method used was an experimental method using a completely randomized design (CRD) consisting of four treatments which were repeated three times. The treatments to be carried out in this study were: Treatment A, adding 0% carrot flour (Control). Treatment B, addition of 3% carrot flour, Treatment C, addition of 5% carrot flour, Treatment D, addition of 7% carrot flour. Each treatment was filled with 10 molly fish measuring 2-3 cm in one aquarium

In this study, the containers used were 12 aquariums measuring 40 cm x 25 cm x 28 cm. Before the maintenance water is added, the aquarium is cleaned first by immersing it in PK (Potassium Permanganate) solution for one day. Fish are acclimatized first for 5 days. The feed given was in the form of pellets with a percentage of feeding 3% of the body weight of the fish added with 0% carrot flour (control), 3%, 5%, and 7% respectively. Commercial feed is mixed with carrot flour according to the treatment and added Carboxymethyl cellulose (CMC) which has been dissolved in hot water as an adhesive. This research lasted for 40 days with the frequency of feeding treatment as much as 2 times a day, morning and evening.

2.3 Parameters Measured

Survival Rate (SR)

Survival Rate (SR) is calculated using the formula (Muchlisin et al 2016) :

$$SR = \frac{N_t}{N_o} \times 100\%$$

Description:

SR = Survival Rate (%)

N_t = Fish number day-t

N_o = Fish number day-0

Water quality

Physico-chemical parameters of water observed once every ten for water quality include: measurement of temperature, DO (Dysolved Oxygen), and pH (Potential of Hydrogen).

Weight Gain (WG)

This absolute weight gain is calculated using the formula (Effendie 1997):

$$H = W_t - W_o$$

Description:

H = Absolute weight gain (g)

W_o = Initial Weight (g)

W_t = Final weight (g)

Length Gain (LG)

The Length Gain formula used is based on (Effendi 1997) as follows :

$$P_m = P_t - P_o$$

Description:

P_m = Length gain average (cm)

Pt = Final length (cm)
 Po = Initial Length (cm)

Molly Fish Body Color Changes

Observations of color changes were carried out once every 10 days for 40 days. The parameters observed were the increase in the color value of molly fish seeds as the main data by sampling three fish in each aquarium. The parameter tool used is Toca Color Finder, which is a tool to identify color specifications. The color specifications used are (TCF Code 0405) to (TCF Code 1015).

2.4 Data Analysis

Data from observations of the color of molly fish seeds were analyzed using the *Kruskal – Wallis* test. If the *Kruskal – Wallis* test shows a significant difference ($H_{count} > H_{table}$), then proceed with the *Z* test. The results of the Survival Rate (SR) data were analyzed using the *F* test with a 95% confidence level to determine the effect of treatment on the parameters. If the treatment has a significant effect ($F_{count} > F_{table}$) then proceed with *Duncan's* multiple range test with a 95% confidence level to find out which treatment has a significantly different effect. Data from observations of water quality were analyzed in a comparative descriptive.

3. RESULTS AND DISCUSSION

3.1 Molly Fish Discoloration Rate

Molly fish head discoloration

Based on the results of research conducted for 40 days, it was shown that the addition of carrot flour affected the orange color of the molly fish head. An increase in the color score indicated that there was an effect of giving carrot flour to the orange color of the molly fish head. Changes in molly fish head color based on TCF from the beginning of the study to the end of the study can be seen in the graph below (Chart 1).

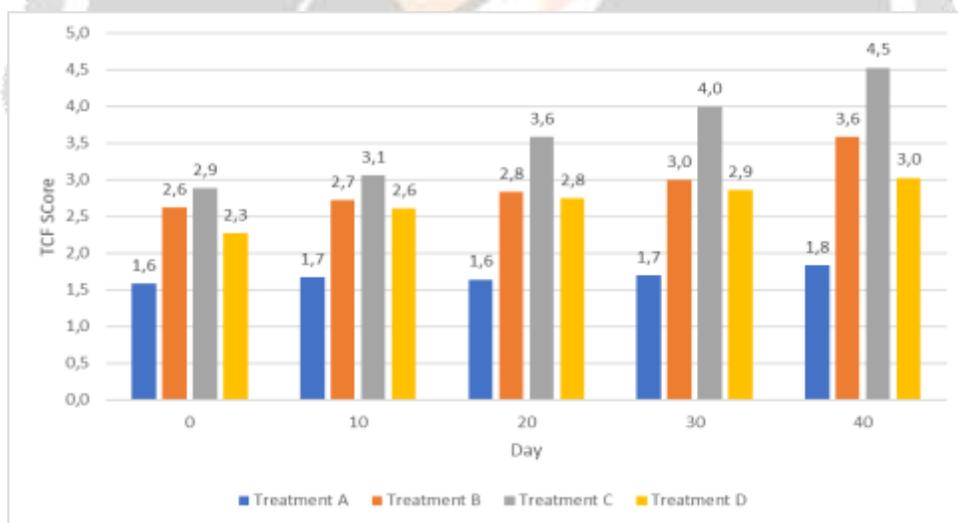


Chart -1: Molly fish head discoloration

Table -1 : Average Color Value of Molly Fish Heads

Treatment	TCF Score on Molly's Fish Head		
	TCF score on day 0	TCF score on day 40	TCF Score Improvement (D40-D0)
A (Control)	1,6	1,8	0,3±0,06 ^a
B (3%)	2,5	3,6	1,1±0,49 ^{ab}

C (5%)	2,7	4,5	1,9±0,38 ^b
D (7%)	2,1	3,0	0,9±0,12 ^{ab}

Note : Different notations show a significant effect $P < 0.05$ (Z multiple range test).

Based on the results of the study, it was found that there was an increase in the brightness level of the body color of the molly fish in each treatment, as shown in Table 1. It was found that the highest value of increasing the brightness of the body color of the fish was found in Treatment C (5%). The results of the *Kruskal-Wallis* test analysis showed that treatment C for 40 days had a significant effect ($P < 0.05$) on increasing the brightness level of the color on the molly fish head. While the lowest treatment was in treatment A, which did not add carotenoid sources to the feed. This is because the commercial feed used does not contain carotenoids, so the chromatophore cells do not spread throughout the fish's skin and can cause the fish to turn pale in color (Sari et al. 2012). Treatment A on the 20th day experienced a decrease in color change, presumably due to a changing environment or when the fish panelists experienced stress when they were taken as objects of color panelists. The decrease in color in fish can be caused by the handling process which stresses the fish so that it becomes a negative factor affecting the brightness of the fish's color (Qun Lin et al. 1998).

Based on multiple comparisons of the Z test, treatment B did not show any different results from treatment D, but treatment B had a higher average value than treatment D. Meanwhile, treatments B and D showed significantly different effects on treatment C. Treatments B (2.5%), C (5%), and D (7%) resulted in an increase in score every 10 days due to the addition of carrot flour to fish feed resulting in fish turning orange in color. The feed given has an influence on the appearance of color, this is because fish cannot make their own color pigments (Mustofa 2009).. Sulawesty (1997), explained that the addition of carotenoids in feed has a maximum limit, meaning that if it is added again to fish feed, at a certain point it will not give a better color change, maybe even the color value will decrease.

Molly fish body discoloration

Based on the results of research conducted for 40 days, it was shown that the addition of carrot flour affected the orange color of the molly fish body parts. An increase in the color score indicated that there was an effect of giving carrot flour to the orange color of the body parts of the molly fish. Changes in molly fish body color based on TCF from the beginning of the study to the end of the study can be seen in the graph below (Chart 2).

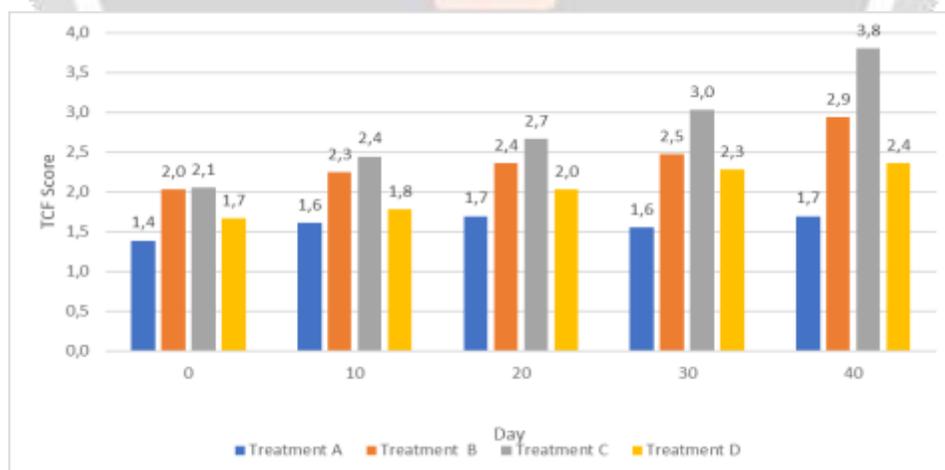


Chart -2: Molly fish Body discoloration

Observation of color changes on the body parts of molly fish during the study showed an increase in color score values from day 10 to day 40 for treatments B (3%), C (5%), and D (7%). The highest increase in color score occurred in treatment C with an average color score of 3.8. Treatment C was the best treatment because the addition of 5% carrot flour was thought to be sufficient for carotenoid needs in fish. This is supported by Satyani and Sugito (1997), fish color changes depending on the amount of color composition in the feed. It requires the right dosage of

color pigment sources, not excessive and not lacking to get the best color appearance in fish. Giving the right dose of color material will clarify the color pattern of the fish's body. On the 10th to the 40th day in treatment C, B, and D there was an increase in color but not for treatment A (control), on the 30th day of treatment A (control) experienced a decrease in body color. This also occurs in the head of the molly fish, where there is a decrease due to the commercial feed given does not contain carotenoids so that the chromatophore cells do not spread throughout the fish's skin and can cause the color of the fish to turn pale (Sari et al. 2012).

Table -2 : Average Color Value of Molly Fish Body

Treatment	TCF Score on Molly's Fish Body		
	TCF score on day 0	TCF score on day 40	TCF Score Improvement (D40-D0)
A (Control)	1,4	1,7	0,3±0,25 ^a
B (3%)	2,0	2,9	0,9±0,35 ^{ab}
C (5%)	2,1	3,8	1,8±0,12 ^b
D (7%)	1,7	2,4	0,7±0,20 ^{ab}

Note : Different notations show a significant effect $P < 0.05$ (Z multiple range test).

The results of the *Kruskal-Wallis* test analysis showed that Treatment C (5%) had the highest average color increase compared to the other treatments. While Treatment A is the treatment that has the lowest average value compared to the other treatments. This is because treatment A does not contain carotenoids in the feed so the fish do not get a source of carotene to improve their color. In treatment C, carrot flour mixed into the feed contained carotenoids in the form of β -carotene so that the fish would get a source of carotene to improve their color. β -carotene is one of the carotenoids responsible for orange and red pigmentation in fish (GT and OE 2016).

3.2 Survival Rate

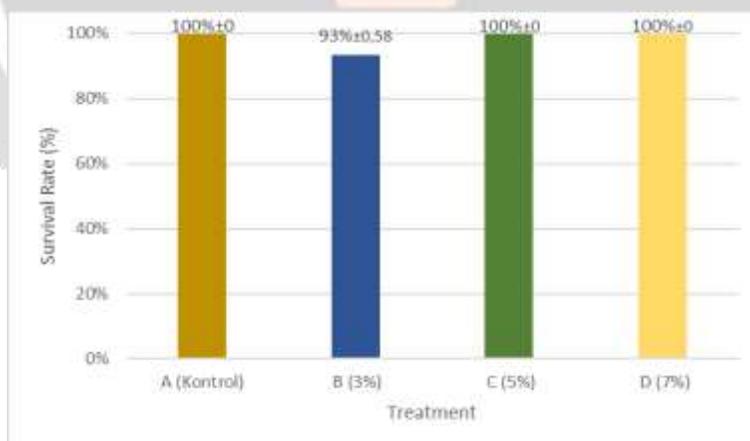


Chart -3: Molly fish Survival Rate

Based on the observations presented in Chart 3, each treatment has varying survival rates. The highest survival during maintenance was in treatments A, C, and D which was 100%, then the lowest survival was in treatment B which was 93%. Treatment B (3% Carrot Flour) died on the 30th day of treatment. It is suspected that the fish experience stress when taken as a panelist object in giving a color score. Changes both external and internal can cause stress to fish. External changes that can cause a stress response include temperature fluctuations, lack of oxygen, and transportation time (Masjudi et al. 2016). The survival of fish is influenced by various factors including

water quality (dissolved oxygen, ammonia, temperature, pH), feed, fish age, environment, and fish health conditions (Adewolu et al. 2008).

3.3 Molly Fish Growth

The growth of molly fish observed in this study was absolute weight and absolute length growth. Growth is a change in fish size both weight and length in a certain period (Effendie 1997). The results of absolute weight growth and absolute length obtained in each treatment during 40 days of maintenance data are shown in Table 3

Table -3 : Molly Fish Weight and Length Growth

Treatment	Weight Gain (g)	Length Gain (g)
A (Control)	0,23±0,033 ^a	0,40±0,104 ^a
B (3%)	0,27±0,020 ^a	0,49±0,106 ^a
C (5%)	0,37±0,016 ^a	0,56±0,068 ^a
D (7%)	0,25±0,034 ^a	0,43±0,105 ^a

Note: Different notations show a significant effect $P < 0.05$ (Z multiple range test).

The results of the analysis of variance F test ANOVA (Analysis of Variance), showed that the addition of carrot flour for 40 days on the growth of absolute weight and absolute length of molly fish obtained $F_{\text{count}} < F_{\text{table}}$ at the 5% confidence level, which means that each treatment did not have a significant effect on weight growth absolute and absolute length of mollies as shown in Table 5. According to Ramadhan (2014) in Nazhira et al. (2017) adding carotenoids to feed did not affect the growth of ornamental fish fed carotene-sourced feed. Fish are thought to make more use of these carotenoids to increase their body color. The use of 5% carrot flour is the best treatment for absolute weight and absolute length growth. Although the results of the analysis of variance stated that the results of the growth data between the control treatment, 3% carrot flour, 5% carrot flour, and 7% carrot flour on absolute weight growth did not show significant results ($P > 0.05$), the growth data on 5% carrot flour has the highest value in absolute weight and absolute length growth. Growth data on the addition of carrot flour by 5% with the highest value for absolute weight growth of 0.37 g and length growth of 0.56 cm.

3.4 Water quality

Water quality parameters observed in this study were temperature, pH, and DO. Observation of water quality in the study was carried out every 10 days. The results of observations of water quality parameters are presented in Table 4.

Table -4 : Observation Results of Molly Fish Water Quality

No.	Parameter	Result
1	Temperature (°C)	25-26,1
2	DO (mg/L)	6-7
3	pH	7,08-7,39

Temperature

The average results for 40 days of temperature research were in the range of 25-26,1 °C. This temperature range is still within tolerance limits because according to Lesmana (2002) which states that the optimal temperature for Molly fish (*Poecilia sphenops*) is around 25 -28 (°C). The results of temperature observations during the study were not significantly different for each treatment, because temperature observations were carried out at the same time and the research site was in a closed area so outdoor conditions that often changed did not affect the research environment.

Dissolved Oxygen (DO)

Dissolved oxygen is the amount of oxygen in milligrams contained in one liter of water (mg/L). Observations showed that the DO average for each treatment during the study was around 6-7 mg/L. It can be said that dissolved oxygen is still within the tolerance limit for rearing molly fish. According to Azila (2010) the higher value of DO in water indicates that the water has good quality for fish rearing. The range of water quality parameters that can still be tolerated by fish is temperature 20-28 °C, pH 4.0-6.0, and dissolved O₂ 2-8 mg/L, optimum 5-7 mg/L.

pH (Potensial of Hydrogen)

Based on Table 4, the pH range in each treatment is from 7.08 to 7.52, and this value is still in the appropriate range for the maintenance of molly fish. The results of pH measurements during maintenance can be said to be feasible for the maintenance of Molly fish. Lesmana (2002) said that most ornamental fish will live well at a slightly acidic to neutral pH range, namely 6.5 - 7.5, while acidity for reproduction or breeding will usually be good at a pH of 6.0 - 7.0. In their natural habitat, fish from the Poeciliidae family, including Molly fish, live at a pH range of 7.5 - 8.0. pH conditions that can interfere with fish life are pH that is too low and pH that is too high (Daelami 2001).

4. CONCLUSIONS

The optimum dose for adding carrot flour to produce optimal molly fish color changes is treatment C with a dose of 5%. This treatment can increase the brightness of the color of the molly fish by increasing the color score in the Toca Color Finder (TCF) reaching 1.9 on the head and 1.8 on the body of the molly fish and getting the best growth among the other treatments. Water quality parameter values are under normal conditions of temperature ranging from 25.2 -26.3°C, DO (Dissolved Oxygen) 6.1-7.3 mg/L, and pH of 7.03-7.86 are in good condition for growth, and the survival rate of mollies..

5. REFERENCES

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