South East Asian Marine Sciences Journal (SEAMAS)
Journal Homepage: https://journal.stedca.com/index.php/seamas

The effect of adding carrot, turmeric, and pumpkin solution to Nemo (*Amphiprion percula*) to increase color brightness

Putra Arif Yanto Umar[1*], M. Dzaky Abdullah[1], Ghina Luthfiyyah Mobonggi[1], Patma[1]
[1]Deparment of Aquaculture, Faculty of Marine and Fisheries Technology,
Universitas Negeri Gorontalo, Gorontalo 96133, Indonesia
Corresponding Author: putra_s1bdperairan@mahasiswa.ung.ac.id

Article Info
Keyword:
Amphiprion percula,
Brightness,
Carrot,
Turmeric,
Pumpkin

Received:
23 January 2025
Accepted:
23 February 2025
Published:
01 March 2025

Abstract
Nemo (*Amphiprion percula*) are interesting ornamental fish living in anemones' tentacles. The body color of Nemo fish determines Nemo's selling price and the level of consumer demand. However, the fading of color in Nemo often occurs due to internal and external factors that can cause public interest and selling value to decrease. Therefore, it is necessary to research the addition of carrot, turmeric, and pumpkin solutions to Nemo to improve their color. This study aims to increase the brightness of the color in Nemo. The research method was carried out using an experimental method using a Completely Randomized Design (CRD) of four treatments and four replications so that 16 experiments were obtained. The study's results stated that adding Carrot, Turmeric, and Pumpkin solutions to Nemo fish did not affect increasing the brightness of the color in Nemo because the F Count obtained <from F Table 5% and 1%. This study emphasizes the importance of taking longer to soak active ingredient solutions such as carrot, turmeric, and pumpkin to obtain maximum results.

1. INTRODUCTION

Nemo (*Amphiprion percula*), commonly known as Clownfish, is one type of ornamental fish from the Pomacentridae family that is in demand by many people because of the beautiful color of the Nemo. One of the interesting things about Nemo fish is its symbiotic mutualism relationship with sea anemones. One of the problems with the beauty of fish is the color that determines the value of the beauty of the fish. This is because the color of ornamental fish is an important aspect of public attraction. The fading of color in ornamental fish can be influenced by several factors, namely internal factors and external factors. Internal factors include genetics, gender, and age, while external factors include the maintenance environment, fish health conditions, and pigment content in feed. The color quality of ornamental fish can be improved in various ways, such as by improving water quality by providing food that contains carotene and color additives (Fathurrahman et al., 2020).

The color of Nemo fish determines the selling price of Nemo fish and the level of consumer demand. The color of the fish is caused by pigment cells found in the cuticle of the fish scales, outside and under the scales. Changes in color brightness are usually caused by the environment, lack of sunlight, disease, and nutrition, especially in the color component (Bianco et al., 2022). The pigment content of the feed is also one aspect that affects the brightness of the color of the fish. The formation of color on the fish's body is due to pigment cells in the outer layer. The intensity of the brightness of the color of the fish can be increased with sources of fish carotenoids. Carotenoids are components of color-forming substances that provide red and yellow colors. The most effective type of carotenoid pigment

found for coloring is astaxanthin (Budi et al., 2021). Therefore, this research needs to be done to help improve Nemo's color. This study aims to increase the brightness of the color in Nemo.

2. RESEARCH METHODS

Time and Place

This research was conducted from May 12, 2023, to May 24, 2023, in Suwawa District, Bonebolango Regency, Gorontalo Province.

Material and Tools

The research method was conducted using an experimental method using a Completely Randomized Design (CRD). Data on Nemo fish color changes, growth in length and weight, and survival rates obtained during the study will be presented in table form, and data on color brightness will be descriptively presented. The maintenance media used were 16 aquariums measuring 30 x 20 x 25 $cm^{3,}$ and the aquariums were filled with 3 L of water. The aspects to be tested used four treatments with four repetitions so that 16 experiments were obtained, and there were 16 aquariums to be used. The following are the details of the treatments to be used:

1. Treatment A: control (without solution)
2. Treatment B: carrot solution 25 mL + turmeric 25 mL + pumpkin 50 mL
3. Treatment C: carrot solution 25 mL + turmeric 50 mL + pumpkin 25 mL
4. Treatment D: carrot solution 50 mL + turmeric 25 mL + pumpkin 25 mL

Procedures

The fish used in this study were 48 Nemo. The feed used was the PF-500 feed. Observation variables in this study included observations of color in Nemo, growth in absolute weight and length, and survival rate.

Observing the color of Nemo fish

Observation of color intensity in Nemo using a standard color paper measuring tool, Toca Color Finder (TCF). Observations are made visually by placing the fish's body on the TCF color measurement paper, which then compares the original color of the fish made with a change in yellow color, then increasing to red (Seran et al., 2022).

Absolute weight and length growth

Measurement of absolute weight and absolute length growth was carried out using the method of weighing the Nemo being kept. Weighing was carried out weekly following Syazili et al. (2022).

$$W = Wt - Wo$$

Information:
W : Absolute weight gain (g)
Wt : Average weight of fish tested at the end of the study (g)
Wo : Average weight of fish tested at the beginning of the study (g)

$$L = Lt - Lo$$

Information:
L : Absolute length growth (cm)
Lt : Average length of fish tested at the end of the study (cm)
Lo : Average length of fish tested at the beginning of the study (cm)

Survival rate

The percentage of survival rate in Nemo will be calculated using the following formula.

$$SR = Nt/No \times 100\%$$

Information:
SR : Survival rate of fish to be tested (%)
Nt : Number of fish tested at the end of the study (fish)
No : Number of fish tested at the beginning of the study (fish)

3. RESULTS AND DISCUSSION

Color Enhancement

Figures 1 and 2 shows that the highest increase in color brightness of Nemo was in treatment D with a dose (of 50 mL carrot solution + 25 mL turmeric solution + 25 mL pumpkin solution), treatment C with a dose (25 mL carrot solution + 50 mL turmeric solution + 25 mL pumpkin solution), treatment A with a dose (control/without solution) and treatment B with a dose (25 mL carrot solution + 25 mL turmeric solution + 50 mL pumpkin solution). The increase in color brightness in Nemo occurred due to the addition of carrot, turmeric, and pumpkin solutions, which contain carotenoids. Carrot, turmeric, and pumpkin solutions can increase the color of Nemo because of the carotenoid content in the solution ingredients. Following the statement from Junaidi & Lestari (2020), fish absorption of carotenoid content is influenced by the dose and type of carotenoid given. After that, we will see whether there is an effect on the feed given the solution for the treatment.

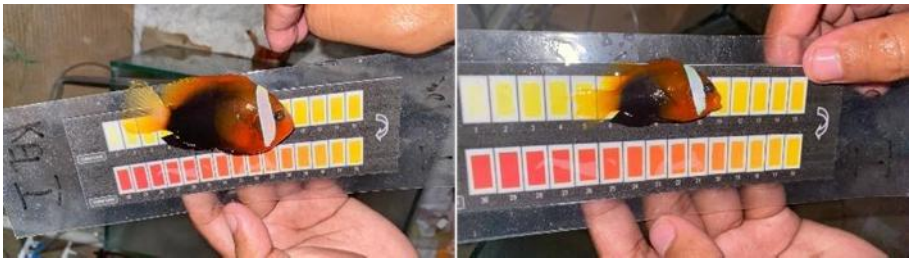

Figure 1. Nemo fish (*A. percula*)

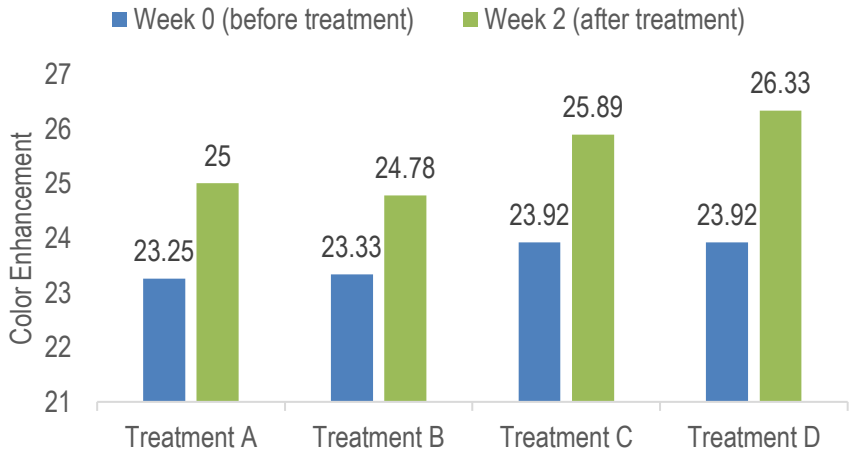

Figure 2. Color enhancement data

Table 1. RAL calculation after treatment

Treatment	Test				Total
	1	2	3	4	
A	27	24.67	25	23	99.67
B	23.33	26	27	21.33	97.66
C	28.67	25.33	26	23.67	103.67
D	26	26	26.67	22	100.67
Total	105	102	104.67	90	401.67

Table 2. Analysis of variance (ANOVA) after treatment

SK	DB	JK	KT	F Count	F Table	
					5%	1%
Treatment	3	4.71	1.57	0.028	3.49	5.95
Error	12	674.62	56.22	-		
Total	15	679.33	-			

Based on the results in Table 2, the analysis of variance (ANOVA) after treatment showed that the use or addition of carrot, turmeric, and pumpkin solutions to 1 kg of feed with different treatments did not have any more effect as stated by the results (F Count < F Table 5% and 1%) on the increase in color of Nemo fish.

Length Growth

The increase in length growth for the average of each treatment can be seen in Figure 3. The best growth was in treatments D, C, A, and B. According to Fathurrahman et al. (2020), the increase in the growth of Nemo was due to the need for sufficient feed as a source of energy for Nemo, and the protein contained in the feed is a nutrient that Nemo very much need for growth.

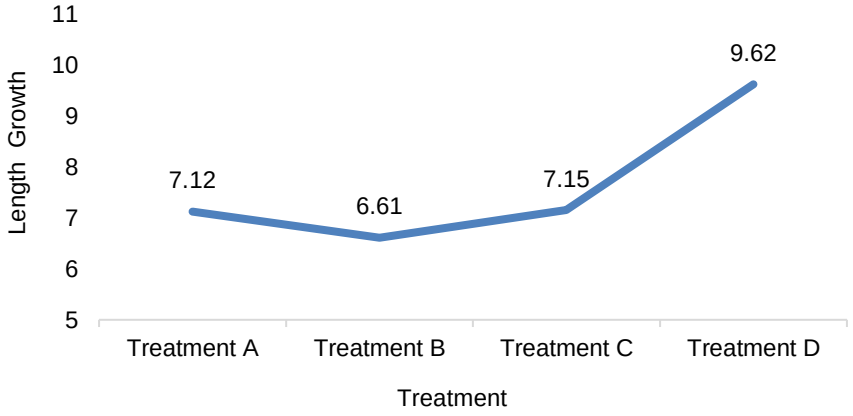

Figure 3. Length growth data

From this, Nemo's highest average length growth was in treatment D because the solution was mixed into the feed with a 2:1:1 balanced energy and protein that met Nemo's needs. Treatment B produced the lowest average growth value for Nemo growth because the solution mixed into the feed with a ratio of 1:1:2 had energy and protein but did not have a balance for the needs of Nemo. Therefore, treatment B had the lowest average growth value for Nemo.

Weight Gain

The increase in weight growth of Nemo fish observed during the study with the highest average weight growth rate was in treatments A, D, B, and the lowest treatment C (Figure 4). Simbolong et al. (2019) state that Nemo needs a balanced diet to grow well. Foods rich in protein, fat, vitamins, and minerals are vital to meet the nutritional needs of Nemo. Environmental conditions such as temperature, water quality, and disease can affect Nemo growth.

Survival Rate

Based on the average results of the survival rate of Nemo fish in Figure 5, different survival results were obtained, namely treatment A (control/without solution) with a percentage of 83.33%, treatment B (25 mL carrot solution + 25 mL turmeric solution + 50 mL pumpkin solution) with a percentage of 83.33%, treatment C (25 ml carrot solution + 50 mL turmeric solution + 25 mL pumpkin solution) with a percentage of 80.56% and the last treatment D (50 mL carrot solution + 25 mL turmeric solution + 25 mL pumpkin

solution) with a percentage of 66.67%. From this, the author concludes that the highest survival rate is in treatment A and treatment B, then treatment C and the lowest is in treatment D (Figure 5).

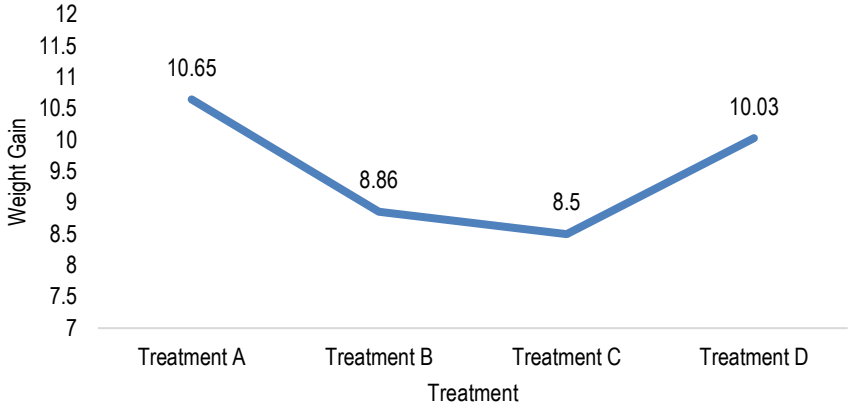

Figure 4. Weight growth data

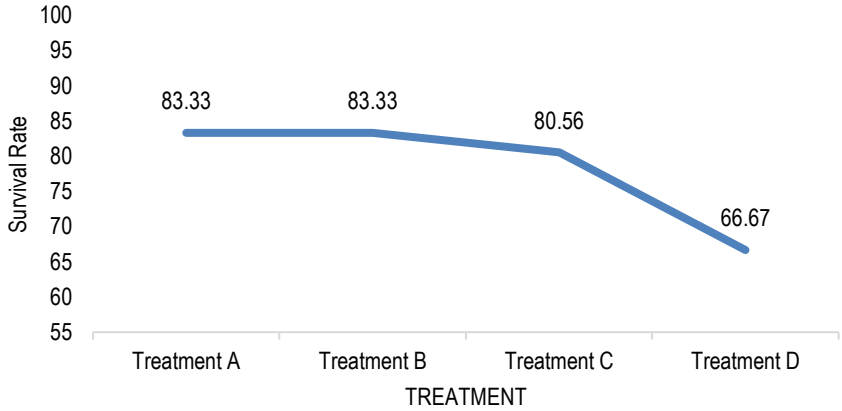

Figure 5. Survival data

4. CONCLUSIONS

Based on the research that has been done, it can be concluded that the addition of carrot, turmeric, and pumpkin solutions by carrying out four different treatments from the highest increase in color change, namely treatments D, C, A, and B looking at the increase in color in day 1 and compared to the increase in color in day 14. From the mixture of solutions with 1 kg of feed in each treatment in the calculation of the analysis of variance (ANOVA), it is suggested that the presence of the solution has no effect because the F Count obtained <from F Table 5% and 1%, then it is stated that it has no impact more. Adding these three solutions to treatment D produces the best color change, length, and weight growth, and treatment A produces the best survival rate.

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