Asian Journal of Fisheries and Aquatic Research

Volume 20, Issue 6, Page 117-124, 2022; Article no.AJFAR.94913
ISSN: 2582-3760

Enhancement of Color Brightness on Clown Fish (*Amphiprion percula)* With Addition of Tomato Powder Extract

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJFAR/2022/v20i6523

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/94913

Original Research Article

Received: 17/10/2022
Accepted: 27/12/2022
Published: 29/12/2022

ABSTRACT

The prospect of clown fish cultivation business is still being expanded to make profitable business activities and increasingly attract ornamental fish lovers. However, it is difficult to get clown fish with a good level of color brightness. So it can reduce the level of sales production. This study aims to determine the effect of the addition of tomato powder to increase the brightness of the color clown fish at the Ambon Marine Aquaculture Fisheries Center. The research was conducted from March to June 2020 at the Ambon Marine Aquaculture Fisheries Center. This study used a Completely Randomized Design (RAL) with 4 treatments and 3 replications. The treatment is to mix tomato powder in the feed with a concentration of 0 mg/gr (Treatment A), concentration 20 mg/gr (Treatment B), concentration 40 mg/gr (Treatment C), and concentration 60 mg/gr (Treatment D). The fish used is a clown fish with a size of 1 cm with a spread of 4 fish with a

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circulatory maintenance system. The observed parameters include the brightness of the clown fish color, which is measured using the color grab camera app, the growth of which is the average length and weight of average seeds measured using a ruler with a precision rate of 1 cm and a digital scale with a precision rate of 0.01gr and survival rate. The results showed that feeding with the addition of powdered tomato did not give a significant effect to increase the brightness of the color of the clown fish. However, it affects the growth (length and weight) and survival rate of clownfish seeds.

Keywords: Clown fish; color; tomato powder.

1. INTRODUCTION

Clownfish is one of the leading commodities of ornamental fish water sea, life in the waters of the coral reef symbiosis with anemones and has a high economic value. Data Center for Statistics and Information Secretariat General of the Ministry of Marine Affairs and Fisheries, the export volume of seawater ornamental fish in 2007 - 2011 increased by 0.26%. The purpose of marketing Nemo fish among them are Australia, Japan, Germany, and France and the ornamental fish Nemo has been identified in the world as many as 34 species [1]. Meanwhile, according to [2] clown fish (Amphiprion) has 28 species of Amphiprion that have been identified that are found in shallow to deep waters, on a shallow base.

The species is known by its common English name which includes orange clown fish, clown anemone fish, percula clown fish, anemone percula fish, orange anemone fish, true percussion clown fish, blackfin clown fish, eastern clown fish, eastern clown anemone fish, and orange clown anemone fish. Common names in other languages include Bantay bot-bot (Cebuano); orangegul klovnfisk (Denmark); pata (Davawenyo); maumanu ni masao (Gela); clownfisch (Jerman); samok-samok (Kagayanen); paja-paja (Makasar); badut biak fish, gelang roay (Melayu); amfiprion (Polandia); baro-baro (Visayan); dan bantay-kibot (Waray-waray). List of common names that is complete can be found on the Fishbase website [3].

Clownfish have an attractive shape and color pattern that is orange (orange), white stripes on the head, body, and base of the tail, and the presence of a black silhouette on the top of the body, and it suitable for fish-only aquarium fillers and reef aquariums [4]. This Nemo fish lives in groups and is always side by side with sea anemones where other fish are unable to survive in the anemone space [5]. The specific symbiosis made this Amphiprion ornamental fish earned the nickname *Anemon fish* or *Badutfish* [2]. In this symbiosis, the fish gets protection and feeds on nonmetabolic materials released by anemones. On the other hand, anemones are cleaned and protected from predators [2].

The difficulty of obtaining seeds with quality that meets export criteria with bright orange seed color and thick black strips resulted in decreased product sales rate. Decreased color brightness can be caused by stress due to the environment, lack of sunlight, disease, lack of feed, and especially lack of color components in the feed. Adding carotene substances can increase color brightness in clown fish. Carotene substances are found in fruits and vegetables, one of which is papaya fruit and carrots. The red-orange fruit contains betacarotene (provitamin A) which is an ingredient in the formation of vitamin A. The results of α [6] study on the addition of carrot pollen to increase the color of clownfish with a dose of 40 ppm beta carotene had a real influence. While the research results of [7] that papaya extract conducted by spraying methods on clown fish seed feed did not see significant changes.

2. MATERIALS AND METHODS

2.1 Time and Location

This research was conducted for 4 months at the Ambon Marine Aquaculture Fisheries Center.

2.2 Tools and Materials

Tools and materials used are aquarium size 40x40x40 cm, color grab camera as color identification, clown fish seed as much as 48 heads, and tomatoes for the manufacture of tomato powder.

2.3 Methods

The research method used a Completely Randomized Design (RAL) with 4 treatments and 3 replicates:

- Addition of tomato powder with a concentration of 0 mg/g (control)
- Addition of tomato powder with a concentration of 20 mg/g
- Addition of tomato powder with a concentration of 40 mg /g
- Addition of tomato powder with a concentration of 60 mg/g

Tomato powder is made by drying first in the oven at a temperature of 65^0C and blending until smooth. Tomato powder mixed on the feed is formed according to the mouth openings of clown fish seeds. Sampling is conducted by direct observation in the field of research conducted. Sampling is done once a week by measuring the color brightness of clown fish seeds using the color grab camera application, growth includes absolute length and weight using a ruler with a precision of 1 cm and a digital scale with a precision of 0.01 gr. Water quality parameters include temperature, pH, DO, and salinity. The administration of tomato powder to increase the brightness of clown fish seed color is analyzed using non-parametric statistical methods with the wallis Kruskal test on spss 22.3.

The basis of wallis kruskal test decision is as follows:

- If the value of Asymp.sig > 0.05, then there is no difference or H0 is accepted and Ha is rejected
- If the value of Asymp.sig < 0.05, then there is a difference or H0 is rejected and Ha accepted.

3. RESULTS AND DISCUSSION

The results showed that treatments A (control), B (20 mg / gr), C (40 mg/gr), and D (60 mg/gr) occur fluctuations in color brightness every week. Decreasing the brightness of the color on the clown fish resulted in the fish being pale yellow. This is alleged because some of the fish did not respond to feed properly so the fish shortage of feed and nutrients. According to the [8] the decline in the brightness of the color of tclownfishish is a change in the color of the morphology, the shortage of the amount of pigment in chromatophore changes caused by the stress due to the environment are less suitable, less sunlight and lack of color components in the feed. While according to [9], less feeding will result in decreased fish color and slow growth.

In increasing the brightness of the color of clown fish need to add color components in the form of beta-carotene contained in fruit or vegetables that are red. According to [9] all parts of tomatoes contain beta carotene but the most dominant is found in tomato meat. The number of carotenes in tomatoes is 56.90 ppm consisting of lycopene, a-carotene, and b-carotene. In the management of feed, tomatoes are processed into powder and mixed with fish feed. In drying tomatoes using a temperature of 65^0C. According to [10], drying tomatoes can use a temperature of 60 – 70^0C so do not use high temperature because it can damage the nutrients contained in the fruit tomato.

To see the effectiveness of the powdered tomatoes mixed in feed the fish were measured based on the HSB (*Hue, Saturation, and Brightness*). The following average results HSB on clown fish can be seen in Figs. 1, 2 and 3.

Based on Fig. 1, the average brightness level of the fish's color with attention to the *hue* result. *Hue* values in treatment A (control) 29.8 ± 1.78 %, B (20 mg/gr) 29.9 ± 3.85 %, C (40 mg/gr) 29.01 ± 1.59 %, and D (60 mg/gr) 27 ±4.50 %. So it can be concluded that treatment D has a low hue value. The lower the value of the hue, it will produce the red color. Hue values range from 0-360° which means the value of 0° is red and continues to increase until the value of 90° is interpreted as yellow [11]. Here's Fig. 2 of the average saturation result as follows:

Based on the result of Fig. 2, the saturation value in treatment A (control) 78.2 ± 3.7 %, B (20 mg/gr) 74.8 ± 12 %, C (40 mg/gr) 74.4 ± 1.6 % and D (60 mg/gr) 80 ±5.1 %. So it can be concluded that the highest saturation value in treatment D. The higher value the saturation is owned, the color appears brighter [12]. Here in Fig. 3 can be seen the average value of the brightness is as follows:

Based on Fig. 3, the brightness value in treatment A (control) 77.9 ± 5.4 %, B (20 mg/gr) 83.2 ± 2 %, C (40 mg/gr) 79.7 ± 3 % and D (60 mg/gr) 83 1.3 %. So it can be concluded that in treatment D has a high brightness value. The higher the value of the brightness that is owned, the colors appear brighter while the lower the value of brightness the dark [12].

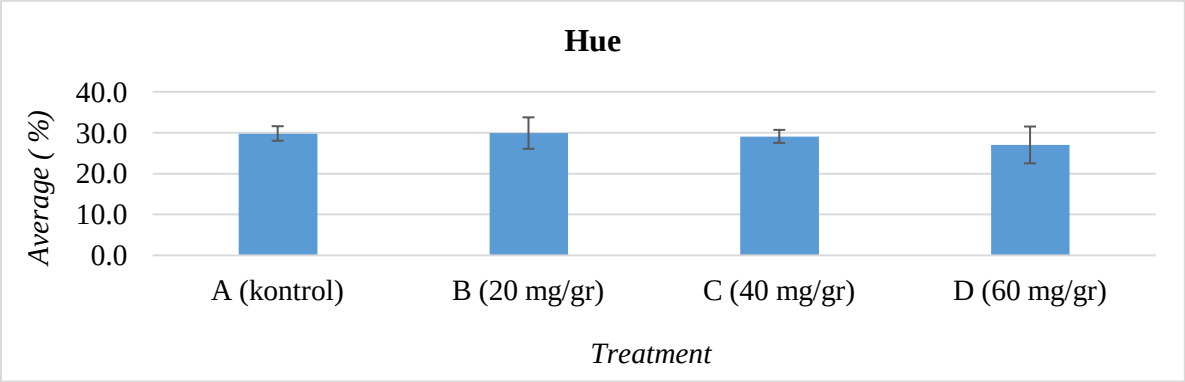


Fig. 1. Average hue value

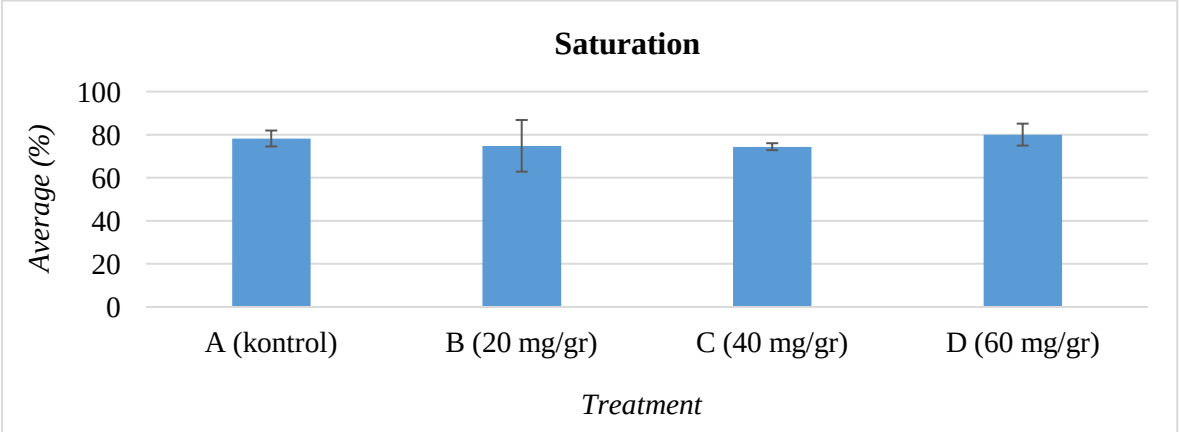


Fig. 2. Average saturation value

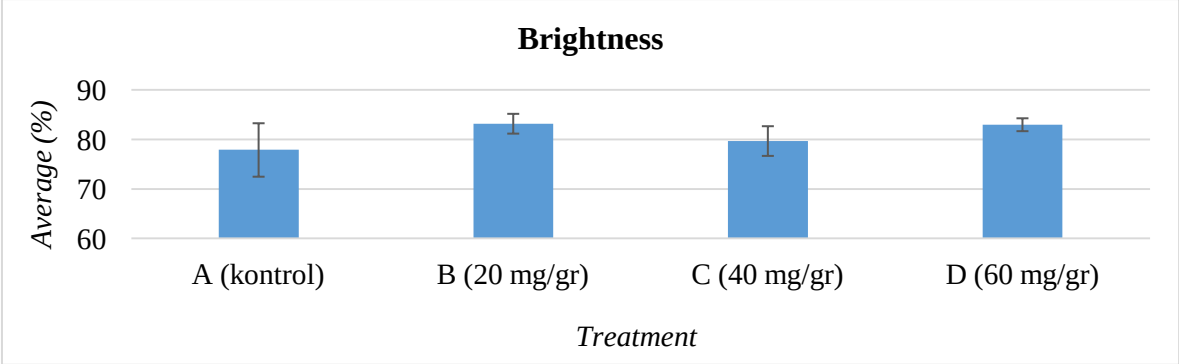
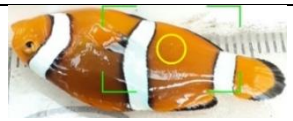
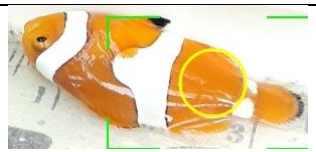
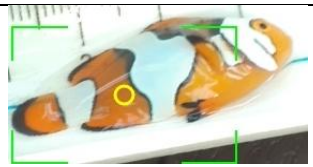


Fig. 3. Average brightness value

Based on Table 1 in treatment A (control) there is no mixing of powder tomato on the feed, so the result from the hue is low and the saturation and the brightness is not too high so as to produce the orange color. In treatments A, B, C and D the value of the hue and low saturation and brightness is high enough so that it produces a reddish-orange color. When viewed from the average result of HSB treatment D there is little change compared to the treatments A, B and C, but the classification of colors remains the same is reddish orange. It is suspected that the dose for treatment D has not been able to meet the needs of carotenoids in the body of fish. According to [13] determining the dose to be used needs to be considered, if too much can decrease the endurance of the fish while if the deficiency results in color on the body of the fish is not maximal.

Table 1. Final sampling of clown fish color brightness levels

			
A (control) ***Hue*: 29,8 %** ***Saturation* : 78,2 %** ***Brightness* : 77,9 %**	**B (20 mg/gr)** ***Hue*: 29,89 %** ***Saturation* : 74,8%** ***Brightness* : 83,2%**	**C (40 mg/gr)** ***Hue*: 29.01 %** ***Saturation* : 74,4 %** ***Brightness* : 79,07%**	**D (60 mg/gr** ***Hue*: 27 %** ***Saturation* : 80 %** ***Brightness* : 83 %**

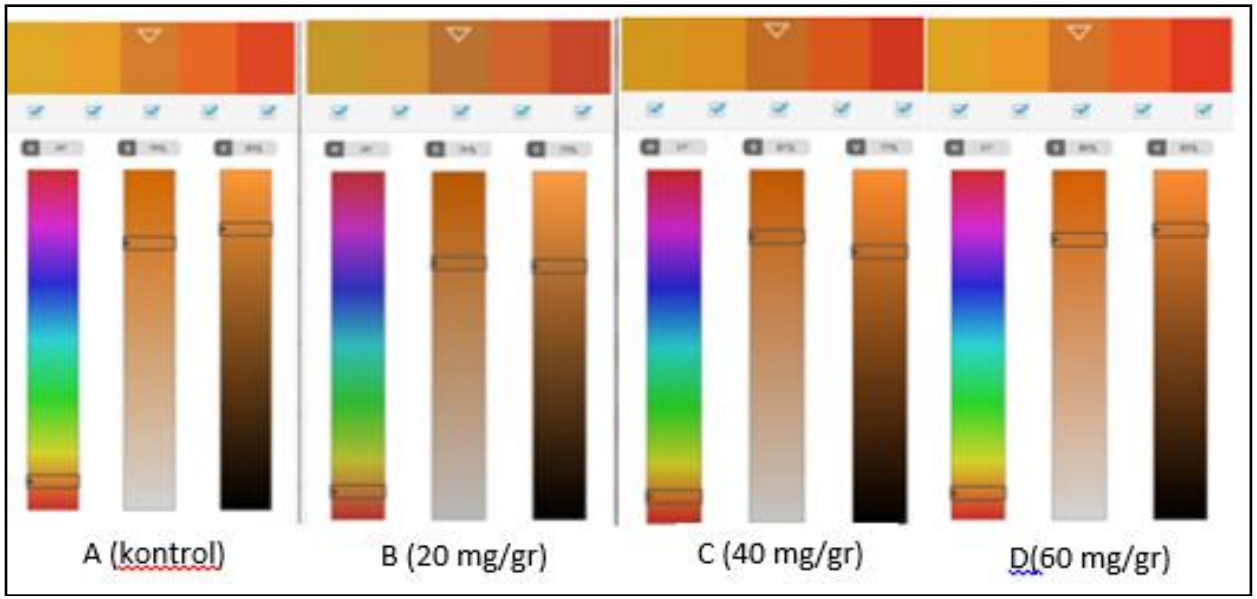


Fig. 4. Image of color identification pattern in *the color grab camera* app

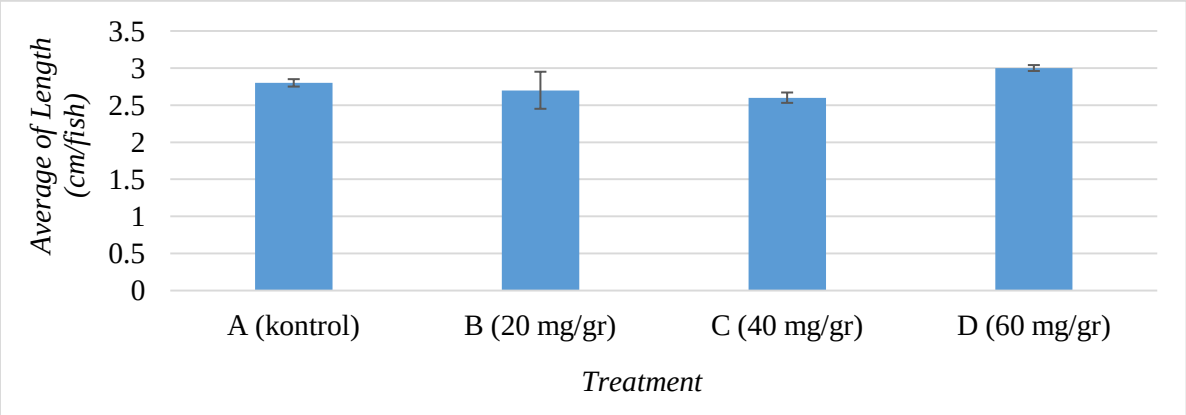


Fig. 5. Average value of observations of length and weight on the seed clown fish

The lower value of the hue it produces a bright red color as well as diimbangin with saturation and high brightness. According to [14] that the color of clownfish is reddish-orange or blackish-orange with a high level of brightness. According to [10] changes in the intensity of color brightness in fish can be increased by adding carotenoid sources to fish feed and the appropriate environment so that fish can develop well. The color performance of hybrid clownfish is better than pure breed clown fish with individual body parts of hybrid and pure offspring showing significant color variations between each other [15]. Water quality during observations such as temperature, salinity, DO and pH is still within tolerance limits. It can be seen from the parameters of the temperature during the observations ranges between 27-29^{0}C. This is in accordance with [16] that, the effect of water temperature on the environment can stimulate growth and appetite because the digestive process of food at low temperatures will be very slow and vice versa will be faster in warmer waters. The optimal and ideal temperature in the maintenance of survival reaches a range between 25-30^{0}C. The result of pH measurement during the study was 7, indicating a value that is still within the tolerance limit. This is in accordance with the statement [17], that, clown fish can live well on a level of acidity ranging from 6-9. The results of measurements DO is 4-6,14 mg/L the content of oxygen that is better for the purposes of cultivation is 5-9 mg/L.

To further confirm the results obtained were analyzed with the kruskal wallis. Based on the kruskal wallis showed that feeding with the addition of powdered tomato did not give a significant effect to increase the brightness of the color clown fish with the results of the kruskal wallis $P < 0.05$. In terms of growth, the average length increase can be seen in Fig. 5.

Based on Fig. 5, it can be concluded that the increase in the length of the average in each of the treatments is not too much different result. In treatment A (control) 2.8 ± 0.05 cm, B (20 mg/gr) 2.7 ± 0.25 cm, C (40 mg/gr) 2.8 ± 0.07 cm, and D (60 mg/gr) 3 ± 0.04 cm. So that the highest average length increase is found in treatment D followed by treatments A, B, and C. Average length of high on-treatment D is suspected because the fish respond to feed properly so that the fish consume feed and absorb the nutrients contained in the feed and used as energy so that the fish can grow well. This is in accordance with [18] that if the fish has the level of feed consumption, the intake of nutrients will be accepted more and will be used for growth. Treatment A has a value not too far from the value of treatment D. It is suspected that fish respond to feed well but the nutrients obtained only nutrients from feed due to treatment A the absence of additional tomato powder. According to [19] that the essential nutrient in growth is vitamins. Tomatoes contain a variety of vitamins: vitamins A, C, D, E, K, D, and B. In the treatment of B and C fish are suspected to have a low appetite because each fish has a different level of feed consumption and optimal so if the feeding has passed the optimal level of feed consumption then the feed is not used for growth but discarded in the form of feces.

Based on Fig. 6, the increase in the average weight in each treatment is not too much different result. In treatment A (control) 2,81±0.94 gr, B (20 mg/gr) 2.76 ± 00.92 gr, C (40 mg/gr) 2.57 ± 0.86 gr, and D (60 mg/gr) 2.95 ± 0.98 gr. So that the highest average weight gain is found

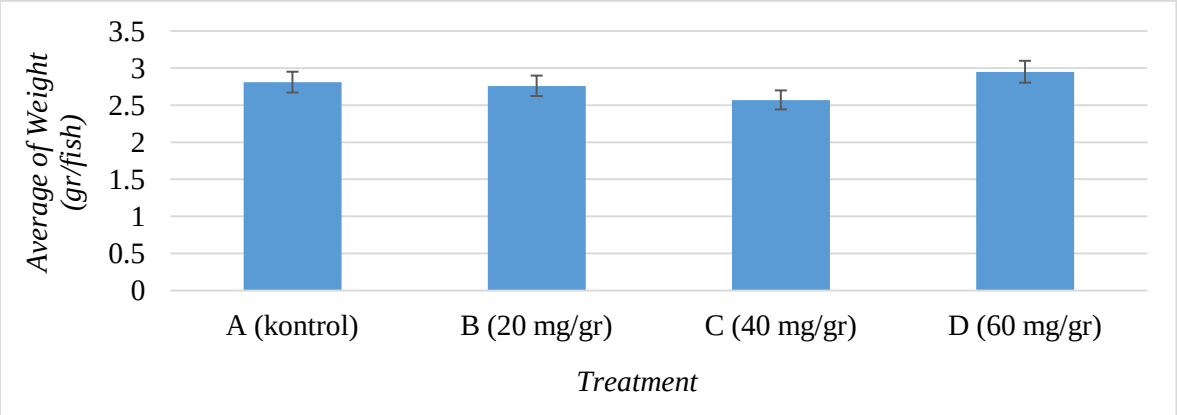


Fig. 6. Average weight of clown fish seeds

in treatment D, followed by treatments A, B, and C. The highest average weight gain on treatment D. The mixture of food pellets and powdered tomatoes gives a red color to the blood so that the fish are more interested to eat it. In accordance with the statement [7] that in addition to the protein factor of food eaten, food attractiveness factor in the form of color and availability of food is also a determining factor of fish growth. Good growth is also suspected because clown fish seeds can absorb the nutrient content in tomatoes so as to get new energy in doing their activities. This is in accordance with [18] one of the nutrients that are important for growth is vitamins. Vitamins are a role in metabolism. In particular, tomatoes are very important in the formation of collagen, to produce fish that grow normally.

In treatment A a value that is not too far from treatment D is suspected of good growth in terms of length and weight indicating that the food given and eaten by the fish can meet the need for maintenance of life. This is in accordance with [18] which states that energy is used by fish for basic metabolism, movement, production of sexual organs, treatment of parts of the body as well as the replacement of cells that have been damaged and for growth. While in treatment B and C have a low appetite. According to [9] less feeding will result in slow growth. So it can be concluded that feeding with the addition of tomato powder can increase the growth of clownfish.

The survival of clownfish from the beginning of maintenance to the end of maintenance of the absence of dead fish indicates that the survival of clownfish during the study is 100% suspected due to the low dense spread and nutrition of feed provided to meet the needs of clown fish and water quality is still limited to normal. According to [4] high survival is suspected because feed nutrients (protein, fat, carbohydrates, vitamins, and minerals) have met the needs of clownfish as well as water quality such as temperature, salinity, and pH are still within tolerance limits. So it can be concluded that feeding with the addition of tomato powder can improve the survival of clownfish.

4. CONCLUSION

Feeding with the addition of powdered tomato did not give a significant effect to increase the brightness of the colors on the fish clown with the results of the Kruskal Wallis $P < 0.05$. But it affects the growth (length and weight) and survival of clownfish seeds.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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