

**THE EFFECT OF ADDING DRAGON FRUIT PEEL FLOUR
(*Hylocereus polyrhizus*) ON THE COLOUR BRIGHTNESS OF
PLATINUM RED TAIL GUPPY FISH (*Poecilia reticulata*) AT THE
FISH HATCHERY CENTER OF SIDOARJO REGENCY**

Pengaruh Penambahan Tepung Kulit Buah Naga (*Hylocereus polyrhizus*) Terhadap
Peningkatan Kecerahan Warna pada Ikan Guppy Platinum Red Tail (*Poecilia
reticulata*) di Balai Benih Ikan Kabupaten Sidoarjo

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ABSTRACT

The Platinum Red Tail Guppy (*Poecilia reticulata*) is a freshwater ornamental fish with high economic value, largely determined by its color quality. This study aimed to determine the effect and optimal dosage of red dragon fruit (*Hylocereus polyrhizus*) peel flour as a natural pigment source in enhancing color brightness. The study was conducted for 30 days using four dosage treatments (0%, 10%, 15%, dan 20%). The results showed that the addition of red dragon fruit peel flour significantly improved color brightness, with the 15% dosage producing the best result. Red dragon fruit peel flour has potential as an environmentally friendly natural pigment source in guppy aquaculture.

Keywords: *Poecilia reticulata*, *Hylocereus polyrhizus*, Colour brightness

ABSTRAK

Ikan Guppy Platinum Red Tail (*Poecilia reticulata*) memiliki nilai ekonomis tinggi yang ditentukan oleh kualitas warnanya. Penelitian ini bertujuan untuk mengetahui pengaruh dan dosis optimal tepung kulit buah naga merah (*Hylocereus polyrhizus*) sebagai sumber pigmen alami dalam meningkatkan kecerahan warna. Penelitian dilakukan selama 30 hari dengan empat perlakuan dosis (0%, 10%, 15%, dan 20%). Hasil menunjukkan bahwa penambahan tepung kulit buah naga berpengaruh nyata terhadap peningkatan kecerahan warna, dengan dosis 15% memberikan hasil terbaik. Tepung kulit buah naga merah berpotensi sebagai sumber pigmen alami yang ramah lingkungan dalam budidaya ikan guppy.

Kata Kunci: *Poecilia reticulata*, *Hylocereus polyrhizus*, Kecerahan warna

INTRODUCTION

Guppies (*Poecilia reticulata*) are a species of freshwater ornamental fish that attract the attention of many researchers and fish enthusiasts. Besides their captivating beauty, guppies are also an interesting subject of study in the fields of biology and fish husbandry (Ahmad, 2021). One strain of guppy that is easily found in Indonesia is the Platinum Red Tail (PRT) guppy strain. This variety is readily available to guppy breeders due to its high demand as an aquarium fish. The Platinum Red Tail guppy strain is unique compared to other guppy strains, due to its attractive body and tail color patterns. The brighter the color of a fish, the higher its value (Nazhira et al., 2017). The color of ornamental fish can be improved through various efforts, such as providing carotene-rich feed and color supplements, and maintaining water quality (Fathurrahman et al., 2020). The color of fish is caused by pigment cells (chromatophores) found in the epidermis. Color changes occur due to changes in the amount and distribution of pigments (Nurrahma et al., 2018). Carotenoids are the primary source of pigmentation in fish skin (Kaur & Shah, 2017).

Physiologically, fish can produce color variations through feed containing color pigments (Yusniarti et al., 2018). Color changes often occur in fish due to changes in pigment levels. Environmental stressors include sunlight, water quality, and pigment content in the feed. Dietary factors influence the color formation of ornamental fish, therefore, it is necessary to provide feed that supports the appearance of these colors (Nazhira et al., 2017). These color changes are caused by the active movement of pigment granules or chromatophores, including xanthophores, erythrophores, and iridophores (Huang et al., 2021). Kalidupa et al. (2018) stated that the addition of red dragon fruit peel as a flour ingredient in the manufacture of artificial feed containing carotenoids is beneficial for enhancing the color brightness of ornamental fish. Dragon fruit peel also exhibits strong antioxidant activity, where peel extract with a concentration of 1 mg/mL is able to inhibit free radicals by $83.48 \pm 1.02\%$, compared to the fruit flesh which is only $27.45 \pm 5.03\%$ (Aiyuni et al., 2017). According to Efianda et al. (2020), dragon fruit peel contains fiber, carotene, calcium, phosphorus, and vitamins B and C, and can act as antibacterials and antioxidants. Carotenoids from red dragon fruit peel are a natural source of β -carotene which can improve the color quality of ornamental fish. This also agrees with Satria & Marhayani, (2020) who stated that dragon fruit peel also contains various bioactive compounds, including flavonoids, polyphenols, betalains, and high levels of β -carotene at 3.452 ppm. In addition, dragon fruit skin contains high levels of β -carotene, which can be used as an additive in feed to improve the color quality of fish (Nurrahma et al., 2018).

RESEARCH METHODS

Place and Time

This research was conducted from November 1, 2025 to November 30, 2025 at the Fish Seed Center, Sidoarjo Regency, East Java Province.

Tools and Materials

Tools used: Chopping board, baking pan, oven, chopper, spatula, blender, 60 mesh filter, glass container, digital scale, gallon, thermometer, DO meter, pH meter, ruler, notebook, color meter. Materials used during the research: PRT guppy fish, red dragon fruit skin, clean water, feed, and label paper.

Methods

The method used is an experimental method that aims to determine the effect of dragon fruit peel flour (*Hylocereus polyrhizus*) concentration on increasing color brightness in Platinum Red Tail guppy fish (*Poecilia reticulata*) in a controlled environment. The research design used is a Completely Randomized Design (CRD) with n indicating the minimum

number of replications of each treatment and *t* indicating the number of treatments. In this study, 4 (four) treatments were used and each consisted of 6 (six) repetitions, thus there were 24 experimental units. A: administration of a dose of 0% dragon fruit peel flour (Control), B: administration of a dose of 10% dragon fruit peel flour, C: administration of a dose of 15% dragon fruit peel flour, D: administration of a dose of 20% dragon fruit peel flour.

Preparation

The rearing medium used was 24 used 15-liter gallon jugs that had been cut, washed with soap, rinsed with running water, and dried in the sun to remove pathogens. Each gallon was filled with 10 liters of well water, placed on a flat surface, and kept out of direct sunlight to maintain stable water quality. The test fish were Platinum Red Tail guppies (*Poecilia reticulata*) measuring approximately 3 cm in size and in good health. The stocking density was 10 individuals per gallon and they were acclimatized for 30 minutes before treatment.

The feed used was commercial NRD 3/5 pellets (55% protein; 300–500 µm size). Feed was provided twice daily at 3% of body weight for 30 days of the study. The peel of red dragon fruit (*Hylocereus polyrhizus*) was washed, thinly sliced, dried in an oven at 50°C for approximately 18 hours, then ground and sieved to obtain a fine, homogeneous powder. Dragon fruit peel flour is mixed into the feed at doses of 0%, 5%, 10%, and 15%, then homogenized and stored in a closed container to maintain quality.

Observation of Color Brightness Level

Color assessment was performed visually by comparing the red color on the fish's back using a Color Finder standard on a scale of 1–5 (from faint to very bright).

Observation data were calculated and averaged for each treatment and replication, then tabulated to obtain a total average and presented in graphical form to illustrate the increase in fish color intensity.

Water Quality Monitoring

Water quality parameters observed included temperature, pH, and dissolved oxygen (DO) levels. Measurements were taken in each experimental aquarium daily, at 9:00 a.m. WIB (Western Indonesian Time) throughout the study period.

Data Analysis

Differences between treatments were analyzed using Analysis of Variance (ANOVA) at a significance level of 5%. Treatments were declared to have no significant effect if the Sig. value was ≥ 0.05 and to have a significant effect if the Sig. value was < 0.05 . If there were significant differences, the analysis was continued with the Least Significant Difference (LSD) test to determine the differences between the treatment means.

RESULT

Observation of the Brightness Level of PRT Guppy Fish Color

The increase in color brightness in PRT guppy fish during the study based on observations can be seen in Figure 1.

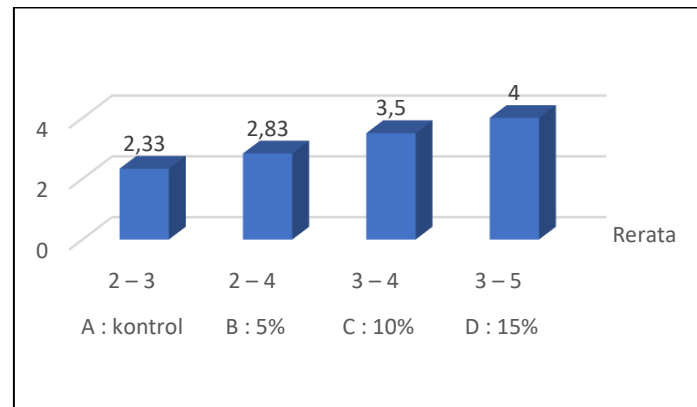


Figure 1. Color enhancement of PRT guppy fish

Based on Figure 1. above, it can be explained that treatment A without the addition of dragon fruit peel flour has an impact of increasing the average color brightness by 2.33. Treatment B with the addition of 10% dragon fruit peel flour has an impact of increasing the average color brightness by 2.83. Treatment C with the addition of 15% dragon fruit peel flour has an impact of increasing the average color brightness by 3.50. Treatment D with the addition of 20% dragon fruit peel flour has an impact of increasing the average color brightness by 4.00. A homogeneity test was carried out to prove that the data on increasing the color brightness of PRT guppy fish was homogeneous using the Levene test presented in Table 1.

Table 1. Homogeneity test of color brightness increase in PRT guppy fish (Levene's test)

Levene Statistics	df1	df2	Sig.	Description
1,284	3	20	.308	Homogen

Based on the results of the homogeneity test using Levene's test, a sig. value of 0.308 was obtained ($p > 0.05$). This indicates that the variance of the data on the increase in color brightness of PRT guppies between treatments is homogeneous, thus meeting the assumptions for a one-way ANOVA test. The following ANOVA test results can be seen in Table 2.

Table 2. ANOVA Test of Color Brightness Increase of PRT Guppy Fish

ANOVA					
Value					
Sources of Diversity	Degree of freedom	Sum of Squares	Middle Square	F Count	Sig.
Treatment	3	10,333	3,444	6,874	0,002
Trial Error	20	10,020	0,501		
Total	23	20,353			

Based on the results of the one-way ANOVA test, the calculated F value was 6.874 with a significance value (Sig.) of 0.002 ($p < 0.05$). This indicates that the treatment had a significant effect on increasing the brightness of the color of PRT guppy fish, so that H_0 was rejected and H_1 was accepted. Thus, it can be concluded that there is a significant difference in the increase in color brightness between treatments, so that further testing can be carried out using the Tukey test in Table 3 as follows:

Table 3. Tukey Test for Increasing Color Brightness of PRT Guppy Fish

Tukey HSD

Feed Dosage	N	Subset for alpha = 0.05			
		1	2	3	4
0% (control)	6	2,333			
10%	6		2,833		
15%	6			3,500	
20%	6				4.000
Sig.		1.000	1.000	1.000	1.000

Uses Harmonic Mean Sample Size = 6.000

In Table 4.5, it can be explained that the difference in the increase in color brightness in PRT guppy fish for treatment A (control) is significantly different from treatments B, C, and D. Treatment B is significantly different from treatments A, C, and D. Treatment C is significantly different from treatments A, B, and D. And treatment D is significantly different from treatments A, B, and C.

Water Quality Monitoring

The results of water quality observations during the research were still in optimal condition, as can be seen in Table 4.

Table 4. Average Water Quality Values

Treatment	Temperature	DO	pH
A : Control	26,2 ^o - 27,1 ^o	6,31 – 6,51	7,1 – 7,8
B : 10%	26,1 ^o - 27,0 ^o	6,20 – 6,37	7,0 – 7,9
C : 15%	26,4 ^o - 27,3 ^o	6,28 – 6,61	7,0 – 8,1
D : 20%	26,3 ^o - 26,9 ^o	6,44 – 6,71	7,2 – 8,0
Source	Fernandi (2023)		

DISCUSSION

Increasing the Brightness of Guppy Fish Colors PRT

The results of the study showed that the addition of dragon fruit peel flour to the feed significantly increased the color brightness of domestic guppies. This was demonstrated by the ANOVA test results, which showed a significant difference between treatments ($p < 0.05$). The increase in color brightness occurred as the dose of dragon fruit peel flour increased, with the treatment with the highest dose producing the highest color brightness. This is consistent with the opinion of Nurhadizah & Puspitasari (2021) that increasing the feed intake with higher pigment concentrations results in brighter fish colors. Color is a key factor in determining the aesthetic value and selling price of domestic guppies. Color intensity in domestic guppies is influenced by the presence of chromatophore cells in the dermis layer of the skin, which absorb and express color pigments (Andriani et al., 2018). These pigments generally come from feed, particularly carotenoid pigments, which fish cannot synthesize themselves and therefore must be obtained from external sources.

Physiologically, the process of color enhancement in fish occurs when carotenoid pigments in feed are absorbed through the digestive tract, then transported through the bloodstream and stored in fatty tissue. Furthermore, these pigments are deposited in chromatophore cells in the dermis layer, causing the fish's body color to appear brighter and more contrasting. Even distribution of pigments in chromatophore cells will produce more

intense colors, while uneven pigment deposition causes the color to appear pale. This is also in line with the opinion of Meilisza et al., (2021), who stated that the intense color of fish occurs due to the even distribution of pigment cells, while the pale color of fish is caused by the clustering of pigment cells at one point in the cell nucleus. The increase in color intensity in the body of PRT guppies indicates that there is an increase in color in each treatment. There are two factors that influence the quality of fish color: internal factors and external factors (Pratama, 2018). Internal factors originate from within the fish's body and are fixed, namely genetics, such as chromatophores and carotenoids. External factors originate from the environment or from outside the fish's body, namely water quality, light, and feed containing high levels of nutrients and carotenoids.

The results of this study align with several previous studies that have shown that increasing the dosage of natural pigment sources in the feed can increase the color brightness of ornamental fish. Fat-soluble carotenoid pigments are known to play a crucial role in the formation and intensity of color in ornamental fish. Therefore, using dragon fruit peel flour as a natural pigment source in feed can be an effective, economical, and environmentally friendly alternative to enhance the color brightness of guppies.

Water Quality

The results of the study showed that all water quality parameters during the maintenance of PRT guppies were within the optimal range and did not differ significantly between treatments. Good and stable water quality conditions support the physiological processes of the fish, so that the fish are able to absorb nutrients and pigments from the feed optimally and do not become a limiting factor in increasing the brightness of the PRT guppy fish color. Water quality plays a crucial role in the success of fish cultivation activities. The suitability of water quality will affect the survival of the cultured fish, in addition to influencing the improvement of the color quality in the fish (Yanuhar et al., 2019). The results of water quality parameter measurements during the study were still in optimal conditions where the temperature ranged from 26.2 - 27.1, dissolved oxygen levels ranged from 6.31 - 6.5 mg/L, and pH ranged from 7.1 - 7.8. This is in accordance with Fernandi (2023) who stated that the ideal water quality for maintaining guppy fish includes temperatures ranging between 24-28°C, dissolved oxygen concentrations ranging between 5-7 mg/L, and water pH ranging between 7.0-8.5.

CONCLUSION

Based on the research results, the addition of red dragon fruit peel flour (*Hylocereus polyrhizus*) to the feed significantly increased the color brightness of Platinum Red Tail guppies (*Poecilia reticulata*) ($p < 0.05$). The higher the dose given, the higher the resulting color brightness value. The best dose in this study was 20% because it produced the highest color brightness increase value. All water quality parameters during the study were within the optimal range so that they were not a limiting factor in improving the color of the fish.

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