Fisheries Journal, 15 (4), 2288-2297 (2025)
http://doi.org/10.29303/jp.v15i4.1668

THE EFFECT OF GIVING DIFFERENT TYPES OF NATURAL FEED ON THE ABSOLUTE LENGTH GROWTH OF GALAXY RASBORA FISH (DANIO MARGARITATUS) SIZE 1.5-2 CM IN EXPERIMENTAL TANKS

Pengaruh Pemberian Jenis Pakan Alami yang Berbeda Terhadap Pertumbuhan Panjang Mutlak Ikan Rasbora Galaxy *(Danio Margaritatus)* Ukuran 1.5-2 cm di Bak-Bak Percobaan

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(Received June 27th 2025; Accepted August 22th 2025)

ABSTRACT

Rasbora galaxy (*Danio margaritatus*) is a type of freshwater ornamental fish that has a fairly high economic value and is in great demand in the international market. This fish is included in the omnivorous group of animals that tend to be carnivorous and can consume natural feed or commercial feed. Natural feed has advantages including very high nutritional content, easy to obtain and cheaper prices when compared to commercial feed. The types of natural feed that can potentially be consumed by rasbora galaxy fish measuring 1.5-2 cm are Tubifex sp), Artemia sp and Daphnia sp. The purpose of this study was to determine the effect of providing different types of natural feed on the absolute length growth of rasbora galaxy fish (Danio margaritatus) measuring 1.5-2 cm in experimental tanks. This study used an experimental method with a Completely Randomized Design (CRD) consisting of 3 treatments and 9 replications. The treatment in this study was in the form of providing different types of natural feed. Treatment A; Tubifex natural feed, treatment B; Artemia sp natural feed and treatment C; Daphnia sp natural feed. The test animals used 1.5 - 2 cm galaxy rasbora fish with an average weight of 0.5 g/tail and an average initial length of 1.5 cm. The stocking density was 15 fish/liter, the experimental media used fresh water with a volume of 3 liters/tank. The results showed that treatment A gave the best results for the absolute length growth of 1.5 - 2 cm galaxy rasbora fish of 0.7 cm/tail. Water quality data obtained water temperature ranged from 26.0-27.0 0C, acidity levels ranged from 6.9-7.2 and dissolved oxygen ranged from 4.5 - 5.0 ppm.

Keywords: Natural Feed Type, Galaxy Rasbora Fish (Danio Margaritatus), Absolute Length Growth

ABSTRAK

Rasbora galaxy (*Danio margaritatus*) termasuk jenis ikan hias air tawar yang memiliki nilai ekonomis cukup tinggi dan sangat diminati di pasar internasional. Ikan tersebut termasuk golongan hewan omnivora cenderung karnivora dan dapat mengkonsumsi pakan alami maupun pakan komersial. Pakan alami memiliki kelebihan diantaranya kandungan nutrisinya sangat tinggi, mudah didapat dan harganya lebih murah bila dibandingkan dengan pakan komersial. Jenis pakan alami yang potensial dapat dikonsumsi ikan rasbora galaxy ukuran 1,5-2 cm adalah *Tubifex* sp*), Artemia* sp dan *Daphnia* sp. Tujuan penelitian ini untuk mengetahui pengaruh pemberian jenis pakan alami yang berbeda terhadap pertumbuhan panjang mutlak ikan rasbora galaxy *(Danio margaritatus)* ukuran 1,5-2 cm di bak-bak percobaan. Penelitian ini menggunakan metode eksperimental dengan Rancangan Acak Lengkap (RAL) terdiri 3 perlakuan dan 9 kali ulangan. Perlakuan dalam penelitian ini berupa pemberian jenis pakan alami yang berbeda. Perlakuan A ; pakan alami *Tubifex*, perlakuan B ; pakan alami *Artemia* sp dan perlakuan C ; pakan alami *Daphnia* sp. Hewan uji menggunakan ikan rasbora galaxy ukuran 1,5 - 2 cm dengan berat rata-rata 0,5 g/ekor dan rata-rata panjang awal 1,5 cm. Jumlah padat tebar 15 ekor/liter, media percobaan menggunakan air tawar dengan volume 3 liter/bak. Hasil penelitian menunjukkan perlakuan A memberikan hasil terbaik terhadap pertumbuhan panjang mutlak ikan rasbora galaxy ukuran 1,5 – 2 cm sebesar 0,7 cm/ekor. Data kualitas air diperoleh suhu air berkisar 26,0-27,0 ^{0}C, derajad keasaman berkisar 6,9-7,2 dan oksigen terlarut berkisar 4,5 – 5,0 ppm.

Kata Kunci: Jenis Pakan Alami, Ikan Rasbora Galaxy (Danio Margaritatus), Pertumbuhan Panjang Mutlak

INTRODUCTION

Ornamental fish are an aquaculture commodity with great potential to support the national economy (Ministry of Maritime Affairs and Fisheries, 2016). In Indonesia, ornamental fish already have a substantial market, and in several regions, production levels are relatively high with distribution extending abroad. Based on data from the Central Statistics Agency (2019), the export value of ornamental fish in the first semester of 2019 reached USD 16.54 million, representing an increase of 2.56% compared to the first semester of 2018. One of the ornamental fish with economic value and an international export market as a tropical aquarium species is the galaxy rasbora (*Danio margaritatus*) (Roberts, 2007).

The galaxy rasbora possesses unique characteristics, including its small size with a standard length of 1.5–2 cm, bright body coloration, body patterns resembling tiny pearl-like spots, fins with orange stripes, and a generally peaceful nature. Iskandar et al. (2022) state that this species has the potential to become a leading commodity due to its relatively high market demand and selling price, especially internationally, in addition to its cultivation techniques being relatively easy for fish farmers to implement.

Effendi (2003) notes that natural feed serves as the primary food source for fish larvae and juveniles because it contains high levels of protein, essential amino acids, fats, vitamins, and minerals that are easily digested and highly required during the early growth phase. The availability of natural feed that can be cultured independently enables cost savings in production and reduces dependence on commercial feed (Asih *et al.,* 2024). The use of natural feed also does not cause deterioration in water quality within aquaculture systems since it is consumed and digested more rapidly, leaving minimal residue, thereby maintaining water stability and reducing the frequency of water replacement (Mansour *et al.,* 2017).

The galaxy rasbora tends to be carnivorous, as its feeding habits rely on small organisms such as zooplankton, small insects, and larvae to meet its nutritional needs. According to Puthli (2023), the galaxy rasbora generally exhibits a feeding pattern that is more dominant toward live small animals, although it can consume a small amount of plant material. Several natural feeds commonly given to the galaxy rasbora include tubifex worms (*Tubifex* sp.), Artemia sp., and water fleas (*Daphnia* sp.). Adequate nutrition is undoubtedly a driver of optimal growth (Simbolon *et al.,* 2021).

The galaxy rasbora uses absolute length as a variable in marketing because fish length serves as a clear and objective indicator for assessing fish quality and size. Standardized sizing ensures that the fish sold meet market expectations, particularly for collectors and ornamental fish enthusiasts who often seek fish of specific sizes. According to Randall (2018), absolute length is used as a standard in ornamental fish marketing to ensure that the fish sold meet buyer expectations regarding size and quality.

RESEARCH METHODS

Time and Place

This research was conducted from May 10 to June 9, 2025, at Mina Makmur Farm, Bojongsari Village, Purbalingga Regency, Central Java, Indonesia.

Materials and Tools

The materials and tools used in this study included Rasbora galaxy fish (1.5–2 cm; average 0.5 g/fish) as the experimental organism, freshwater as the culture medium, detergents for cleaning equipment, natural feed, and ketapang leaves to improve water quality. Research tools consisted of plastic jars with a capacity of 5 liters (27 units) as culture containers, aerators and accessories, fish nets, digital scales for measuring biomass, rulers, pH meters, thermometers, DO meters for dissolved oxygen measurement, writing instruments, a mobile phone camera for documentation, and a laptop for data recording. Each container was filled with 3 liters of water, left to settle for 24 hours, aerated, and supplemented with ketapang leaves to maintain sterility and water quality. The experimental feed consisted of three types of natural feed: Tubifex sp., Artemia sp., and Daphnia sp., provided fresh at a dosage of 4% of total biomass/day.

Method

This study employs an experimental method, which is considered the most scientifically valid as it involves strict control of confounding variables outside the treatment (Arsyad & Fatmawati, 2018). The design used is a Completely Randomized Design (CRD) with three treatments and nine replications (Muhazzir et al., 2025). The treatments consist of different types of natural feed given to galaxy rasbora fish measuring 1.5–2 cm, namely: (A) *Tubifex* sp. (silk worms), (B) *Artemia* sp., and (C) *Daphnia* sp. (water fleas).

Research Procedure

The study involved preparing and arranging research containers, filling each with 3 liters of freshwater and ketapang leaves, and applying aeration after 24 hours. Test animals were acclimated, weighed, and measured for initial body length. They were stocked at 15 individuals per tank and fed 4% of their biomass twice daily with different natural feeds (Tubifex sp., Artemia sp., and Daphnia sp.). Water was replaced every three days, and water quality was monitored. At the end, final body lengths were measured to determine growth.

Test Parameters

The parameters observed in this study included the absolute length growth of *rasbora galaxy* and water quality as a supporting parameter.

Absolute Length Growth

The absolute length growth of the fish was measured to determine the effect of different types of natural feed. The formula used follows Zonneveld (1991):

$$Lm = Lt - Lo$$

Description:

- Lm : Absolute length growth of fish (cm)
- Lt : Average final length of fish (cm)
- Lo : Average initial length of fish (cm)

Measurements were taken using a ruler, and the results were recorded in centimeters.

Water Quality

Water quality was maintained and monitored to ensure optimal conditions during the study. According to Lesmana (2004), good water quality for freshwater ornamental fish includes parameters such as temperature, pH, and dissolved oxygen. Proper water quality is essential to support fish health, as stated by Puspita (2012), ensuring that fish remain healthy and display optimal appearance. Measurements were taken routinely using a thermometer (°C), pH meter, and DO meter (mg/L).

Data Analysis

Research data were analyzed using one-way ANOVA to evaluate the effect of natural feed on the growth of 1.5–2 cm Galaxy Rasbora. Significant results were further tested with LSD/BNT using IBM SPSS Statistics 21 (Prayitno, 2012)

RESULTS

Based on the results of the study on the effect of different types of natural feed on the absolute length growth of rasbora galaxy fish (Danio margaritatus) with a size of 1.5–2 cm, it was found that the mean values differed among treatments, as presented in Appendix 12. The range, mean, and standard deviation of absolute length growth of rasbora galaxy fish sized 1.5–2 cm for each treatment can be seen in Table 1 below.

Table 1. Range, mean, and standard deviation of absolute length growth of rasbora galaxy fish sized 1.5–2 cm for eachr teatment

Treatment	Range of absolute length growth of rasbora galaxy fish sized 1.5–2 cm	Mean (cm)	Standard deviation (SD)
A	0,5 - 0,9	0,7	0,11
B	0,4 - 0,8	0,5	0,13
C	0,0 - 0,4	0,4	0,12

Based on Table 1 above, it can be explained that Treatment A showed the highest mean value for the absolute length growth of rasbora galaxy fish sized 1.5–2 cm. Subsequently, Treatments B and C, in sequence, showed decreasing mean values for the absolute length

growth of rasbora galaxy fish sized 1.5–2 cm. Figure 1 below presents the graph of the mean absolute length growth of rasbora galaxy fish sized 1.5–2 cm for each treatment.

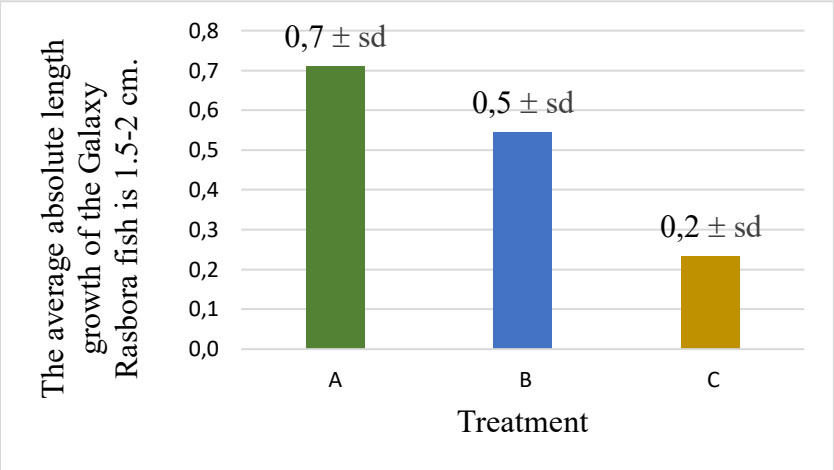

Figure 1. Graph of the mean absolute length growth of rasbora galaxy fish sized 1.5–2 cm for each treatment

To determine whether there were significant differences among treatments, a one-way ANOVA test was conducted, and the results are presented in Table 2 below.

Table 2. One-way ANOVA test of absolute length growth of rasbora galaxy fish sized 1.5–2 cm

	Sum of Squares	**Df**	***Mean Square***	**F**	**Sig.**
Between Groups	105,852	2	52,926	34,228	0,001
Within Groups	37,111	24	1,546		
Total	142,963	26			

Based on Table 2 above, it can be explained that the provision of different types of natural feed had a significant effect on the absolute length growth of rasbora galaxy fish sized 1.5–2 cm ($P < 0.05$). Furthermore, to determine the level of difference between each treatment on the absolute length growth of rasbora galaxy fish sized 1.5–2 cm, a 5% LSD test was conducted, and the results are presented in Appendix 13. Meanwhile, the mean values and notations of absolute length growth of rasbora galaxy fish sized 1.5–2 cm can be seen in Table 3 below.

Table 3. Mean values and notations of absolute length growth of rasbora galaxy fish sized 1.5–2 cm

Treatment	**N**	***Subset for alpha* = 0,05**		
		1	**2**	**3**
C	9	0,2[a]		
B	9		0,5 [b]	
A	9			0,7 [c]

Based on Table 3 above, it can be explained that Treatment A was significantly different from Treatments B and C, and subsequently, Treatment B was significantly different from

Treatment C.

Water Quality

Water Temperature

The water temperature during the study ranged from 26.0 – 27.0 °C, and the complete data can be seen in Appendix 14. The range, mean, and standard deviation of water temperature for each treatment are presented in Table 4 below.

Table 4 Range, mean, and standard deviation of water temperature in each treatment

Treatment	Temperature	Mean	Standar deviasi (sd)
A	26,0 – 27,0	26,28	0,4
B	26,0 - 27,0	26,33	0,4
C	26,0 – 27,0	26,33	0,4

Based on Table 4 above, it can be explained that the mean water temperature in each treatment shows relatively similar values. To determine whether there were significant differences in water temperature among treatments, a one-way ANOVA test was conducted and the results can be seen in Table 5 below.

Table 5. One-way ANOVA test of water temperature

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	0,074	2	0,037	0,138	0,972
Within Groups	6,444	24	0,269		
Total	6,519	26			

Based on Table 5, it can be explained that water temperature in each treatment did not have a significant effect on the absolute length growth of galaxy rasbora fish (*Danio margaritatus*) with a size of 1.5–2 cm ($P > 0.05$).

Acidity Level (pH)

The acidity level during the study ranged from 6.9 to 7.2, and the complete data can be seen in Appendix 15. The range, mean, and standard deviation of acidity level in each treatment are presented in Table 6 below.

Table 6. Range, mean, and standard deviation of acidity level in each treatment

Treatment	pH	Mean	Standar deviasi (sd)
A	6,9 - 7,2	7,03	0,08
B	6,9 - 7,1	7,01	0,06
C	6,9 - 7,2	7,03	0,08

Based on Table 6 above, it can be explained that the mean acidity level in each treatment shows relatively similar values. To determine whether there were significant differences in acidity level among treatments, a one-way ANOVA test was conducted and the results can be seen in Table 7 below.

Table 7. One-way ANOVA test of acidity level

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	0,296	2	0,148	0,239	0,789
Within Groups	14,889	24	0,620		
Total	15,185	26			

Based on Table 7, it can be explained that the acidity level in each treatment did not have a significant effect on the absolute length growth of galaxy rasbora fish (*Danio margaritatus*) with a size of 1.5–2 cm (P > 0.05).

Dissolved Oxygen (O_2)

Dissolved oxygen during the study ranged from 4.5 to 5.00 ppm, and the complete data can be seen in Appendix 16. The range, mean, and standard deviation of dissolved oxygen in each treatment are presented in Table 8 below.

Table 8. Range, mean, and standard deviation of dissolved oxygen in each treatment

Treatment	Dissolved oxygen (ppm)	Mean	Standar deviasi (sd)
A	4,50 - 5,00	4,63	0,20
B	4,50 - 5,00	4,63	0,20
C	4,50 - 5,00	4,56	0,16

Based on Table 8 above, it can be explained that the mean dissolved oxygen in each treatment shows relatively similar values. To determine whether there were significant differences in dissolved oxygen among treatments, a one-way ANOVA test was conducted and the results can be seen in Table 9 below.

Table 9. One-way ANOVA test of dissolved oxygen

	Sum of Squares	Df	*Mean Square*	F	Sig.
Between Groups	3,630	2	1,815	0,462	0,635
Within Groups	94,222	24	3,926		
Total	97,852	26			

Based on Table 9, it can be explained that dissolved oxygen in each treatment did not have a significant effect on the absolute length growth of galaxy rasbora fish (*Danio margaritatus*) with a size of 1.5–2 cm (P > 0.05).

DISCUSSION

Absolute Length Growth of Galaxy Rasbora (*Danio margaritatus*) Measuring 1.5–2 cm

The results of the study on the effect of different types of natural feed on the absolute length growth of galaxy rasbora fish (*Danio margaritatus*) with a size of 1.5–2 cm obtained the following data; treatment A = 0.7 cm/fish, treatment B = 0.5 cm/fish, and treatment C = 0.2 cm/fish. Based on a one-way 5% ANOVA test, it can be explained that the provision of different types of natural feed had a significantly different effect on the absolute length growth of galaxy rasbora fish sized 1.5–2 cm.

The absolute length growth of galaxy rasbora fish sized 1.5–2 cm reached the highest average in treatment A compared to B and C. This is due to the provision of *Tubifex* sp. (treatment A), which has a higher protein content compared to Artemia sp (treatment B) and Daphnia sp (treatment C). Sugandy (2001)stated that the protein content of Tubifex sp is 57% and Daphnia sp is 42.66%, while Artemia sp contains 46% protein (Jusadi, 2003). The quality indicator of natural feed is determined by its protein content, as protein is needed for the formation, growth, and development of tissues and can also serve as an energy source (Sukamti, 1994). The test animals highly prefer natural food with very high protein content because it can quickly stimulate their growth. *Tubifex* sp. contains essential amino acids that can help the test animals produce growth hormones, enabling them to grow faster and healthier.

Tubifex sp. with its smaller size and soft texture, makes it easier for the test animals to digest, allowing nutrients to be absorbed optimally. *Tubifex* sp. is highly effective for small carnivorous ornamental fish such as galaxy rasbora, which belongs to the category of micro-predators that naturally feed on small organisms such as zooplankton and micro-worms in their natural habitat. Therefore, the provision of *Tubifex* sp. is highly suitable for their biological needs and natural feeding behavior. Actively moving Tubifex sp at the bottom of the water can attract the attention of the test animals and trigger their natural hunting response. Subandiyah *et al.* (2003), stated that *Tubifex* sp. has several advantages, including relatively slow movement that stimulates test animals to consume it, its size matching the mouth opening of the test animals, being easily digestible, and being a type of natural feed with a high level of palatability for the test animals. Ramadhani (2015) stated that ornamental fish fry given Tubifex sp feed showed better growth response and survival compared to those given *Artemia* sp.

The results of treatment B showed a tendency for a decrease in the average absolute length growth of galaxy rasbora fish sized 1.5–2 cm compared to treatment A. This is due to the provision of *Artemia* sp. (treatment B), which has a lower protein content compared to *Tubifex* sp. *Artemia* sp. is less optimal when used as the main feed for test animals. The natural habitat of this type of feed comes from saline or brackish water environments. The physiological conditions and ionic content in *Artemia* sp. are not fully compatible with the metabolic needs of test animals that live in freshwater habitats, thereby reducing the efficiency of nutrient absorption required by the test animals. In the bottom of the water tanks used in the study, some *Artemia* sp. were observed to have died, although in a very small proportion, and this condition slightly affected the growth of the test animals because their nutritional needs began to decrease. The use of *Artemia* sp. as feed for freshwater fish requires special treatment, such as being processed into powder beforehand. *Artemia* sp. naturally lives in aquatic environments with high salinity such as salt lakes and lagoons, making it less able to survive long in freshwater. Studies show that *Artemia* sp. can only survive for approximately 5 hours in freshwater before dying, and if this condition persists, it can reduce water quality and cause stress in fish (Dahmiko, 2017; Santosa, 2013; Sulistiyarto & Bakrie, 2024).

Compared to treatments A and B, treatment C showed the lowest average in the absolute length growth of galaxy rasbora fish sized 1.5–2 cm. This is due to the provision of *Daphnia* sp. (treatment C), which has the lowest protein content compared to *Tubifex* sp. and *Artemia* sp. The protein content of *Daphnia* sp. does not meet the protein requirements of the test animals, resulting in inhibition of tissue formation, growth, and development, and it cannot function optimally as an energy source. The test animals, as small and active ornamental fish with very high metabolism, require sufficient protein intake to support growth and strengthen their immune system. Jusadi (2003) stated that if feed does not contain protein suitable for the fish's needs, the conversion of feed into flesh becomes inefficient.

CONCLUSION

Based on the results of the study on the effect of different types of natural feed on the absolute length growth of galaxy rasbora (*Danio margaritatus*) measuring 1.5–2 cm in experimental tanks, the following conclusions can be drawn: (1) The provision of different types of natural feed had a significant effect on the absolute length growth of galaxy rasbora measuring 1.5–2 cm, with Treatment A yielding the best result of 0.7 cm/fish. (2) The water quality data showed that water temperature ranged between 26.0–27.0 °C, pH ranged between 6.9–7.2, and dissolved oxygen ranged between 4.5–5.0 ppm. These three water quality parameters remained homogeneous and therefore did not affect the absolute length growth of galaxy rasbora measuring 1.5–2 cm.

ACKNOWLEDGEMENTS

The author would like to express sincere gratitude to all parties who contributed to the completion of this research. Special thanks are extended to the Dean, Vice Dean, Head of Study Program, and Thesis Supervisors at Universitas Dr. Soetomo Surabaya for their invaluable guidance and direction throughout the study. The author also sincerely appreciates both parents, siblings, and partner for their continuous moral support, motivation, and prayers, which served as the main source of strength in completing this research.

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