University of Muhammadiyah Malang, Indonesia
e-ISSN 2622-4836, p-ISSN 2721-1657, Vol. 3 No.1, February 2020. pp. 21–31
IJOTA Indonesian Journal of Tropical Aquatic
Journal homepage: http://ejournal.umm.ac.id/index.php/ijota

The effect of combination of *Tubifex* sp. and artificial feed on the growth and molting of Giant Shrimp (*Macrobrachium Rosenbergii*) stadia V.

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ARTICLE INFO

Keywords:
Silkworm
Cake Feed
Moulting
Growing

ABSTRACT

Giant Prawns (*Macrobrachium rosenbergii*) or freshwater prawn is also one of the crustaceans, which has the largest size compared to other freshwater prawns, in addition to giant prawns have a high economic value. The obstacle to the giant prawn's cultivation is determining the combination of natural and artificial feeding for giant prawns to improve molting quickly and increasing the growth of giant prawns. The method used was the experimental method, Completely Randomized Design (CRD) with five treatments: P1 (100 % Pellet), P2 (25 % Tubifex + 75 % Pellet), P3 (75 % Tubifex + 25 % Pellet), P5 (100 % Tubifex) and 3 replications. The data were analyzed using diversity analysis (ANOVA), and if there were differences it could be continued with the BNT test. The results showed that the influence of *Tubifex* sp. and natural feeding percentage and artificial feeding on moulting acceleration and growing Giant Prawns/Crawfish (*Macrobrachium Rosenbergii*) stadia V greatly influenced the molting of giant prawns. The water quality during the study ranged from 23 ˚C to 29 ˚C, dissolved oxygen 3.6 to 8.7 mg L^{-1}, and pH ranged from 7.3 to 8.9. The conclusions from the 30 d of study obtained the highest results for molting on the second treatment (P2) was 0.43, while the fourth treatment (P4) was the best combination in weight growth with a value 6 390.42 mg, and long growth showed that the P4 also gave the highest result which is 406.75 mg.

How to cite:
Wijayanti D, Sutarjo GA, Hakim RR. 2020. The effect of combination of Tubifex sp. and artificial feed on the growth and molting of Giant Shrimp (Macrobrachium Rosenbergii) stadia V. *IJOTA,* 3(1): 21–31
DOI: https://doi.org/10.22219/ijota.v3i1.5879

1. Introduction

Ministry of Maritime Affairs has established the prawns as one of the national superior commodity alternatives. This policy was taken in conjunction with the release of new prawn varieties

known as GIMacro (Genetic Improvement of *Macrobrachium rosenbergii*). Giant prawns have a high economic value of 50 000 to 70 000 for every 1 kg. This is because the prawns rearing time is relatively short 3 to 5 months at the enlargement stage, the high production level is 2 to 5 tons per hectare per cycle depending on the stocking density and the technology used, and the high survival reaches 80 to 85 % (Khairuman and Amri, 2004). The fifth stadia prawns are more likely to experience molting than stadia on other shrimp.

Growth in fifth prawns stadia fifth, one of which is influenced by the quality of the feed given every day, feed with good quality will produce a quality prawns as well. The feed given to the fifth stadia prawns is a natural and artificial feed. Natural feed is a type of feed provided by nature, whose texture has adjusted the mouth opening of prawns, while artificial feed is a feed that can be held by humans themselves in order to achieve the desired growth target, including the nutritional needs required by shrimp (Handajani, 2010). Natural feeding is certainly a major factor in aquaculture, where the first state that includes nutritional needs is found in natural food. One of the artificial feeds given to the fifth stadia prawns in cake form. Feed the cake according to the opening of the fifth prawns of the fifth stadia. The benefits of cake feeding have the appropriate physical shape of the mouth opening, also practical in feeding (Khasani, 2013). Sufficient nutrient content for giant prawns is a good feeding requirements. Every cultivation business has a target to achieve growth quickly, it can be a combination in the provision of natural feed and artificial feed (Komala, 2008). Therefore, this study was conducted to determine the effect of combination of natural feed and artificial feed on moulting acceleration and growth of giant prawns (*Macrobrachium rosenbergii*) fifth stadium.

2. Material and methods

2.1. Feeding and Feeding Preparation

Feeding begins by weighing the feed ingredients in accordance with the formulation. Feed raw materials are separated between dry ingredients such as skim milk, wheat flour and vitamin C with liquid ingredients such as fish and chicken eggs. There is a manufacture of feed for giant prawns. The finished feed is cooled before it is applied to the giant prawn larvae and some can be stored in the freezer or refrigerator. Feeding by giving slowly and allowing the cake feed to sink by itself to the bottom of the aquarium (Boga, 2002).

2.2. Preparation Prawns Stadia Post Larva

The sample prawn used were stadia v giant prawns from Samas Central Java. Before it was used, the prawns were weaned that is familiarized eating with feed treatment for 5 d. The feed used cake feed with selected ingredients.

2.3. Moulting Calculation

Molting known by counting the number of prawns that make the perfect change of skin or molting during the maintenance process and then calculated the percentage. According to Hakim (2009) to know the molting frequency, can be calculated with the following formula:

$$\text{Moulting Frequency} = \frac{\text{Moulting amount}}{\text{Biota amount}}$$

2.4. Growth calculation

The observed growth data were weight gain (g) and length gain (mm). According to Handajani and Widodo (2010), the specific growth rate was measured using the following formula:

$$GR = \frac{(Wt\text{-}Wo)}{t}$$

GR: absolute growth rate
Wt: weight of end fish (gr)
Wo: initial fish weight (gr)
t: maintenance time (day)

2.5. Data analysis

The obtained were then analyzed by variance or analysis of variance (ANAVA) to determine the effect of the treatment to the result of the research. If the effect is real, then it is done with the smallest real difference test (BNT) to determine optimal treatment at 95 % to 99 % confidence level comparing the values between treatments resulting from the study is described in a descriptive manner.

3. Results and Discussion

3.1. Moulting

Moulting frequency data during the study was obtained by observation on giant prawn larvae that experienced moulting. The observation of moulting frequency of giant prawn larvae as a result of combination of natural feeding of silk worm and artificial feed in cake form can be seen in the following figure:

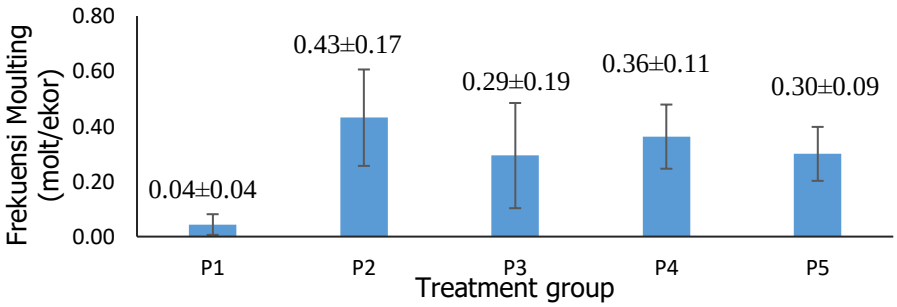

Figure 1. Moulting Acceleration Rate

From the results of graph diagram above, it can be seen that the highest moulting acceleration results are in treatment 2 (P2), can be seen from the results of fingerprint. The result of the analysis of variance (ANAVA) for the acceleration of moulting of vine prawn larvae v with the combination of natural feed in the form of silk worm and artificial feed in the form of cake has very significant effect, the result of variance as follows:

Table 1. Variety Moulting Skins

Sources of diversity	Db	JK	KT	F. Cal	F. Table	
					0,05	0,01
Treatment	4	0.34	0.09	4.69*	3.06	4.89
Error	15	0.27	0.02			
Total	19	0.62				

Description: *= real effect

The result of variance indicated that the combination of natural feed in the form of silk worm and artificial feed in cake form had significant effect on moulting acceleration because F. Count 4.69> from F table 5 % (3.06) and F. Count more < of F. Table 1 % (4.89). Therefore it is necessary to test the BNT, BNT test results can be known as follows:

Table 2. BNT Moulting Test

Treatment	Average	P1	P3	P5	P4	P2	notation
		0.04	0.29	0.30	0.36	0.43	
P1	0.04	0.00					a
P3	0.29	0.29**	0.00				b
P5	0.30	0.26**	0.01^{ns}	0.00			b
P4	0.36	0.32**	0.07**	0.06**	0.00		c
P2	0.43	0.39**	0.14**	0.13**	0.07**	0.00	d

The highest moulting frequency in P2 treatment is a combination of natural feeding in the form of 25 % silk worm and artificial feed in the form of cake 75 % with value 0.43 mg L^{-1}. However, the lowest molting frequency in treatment P1 which is a combination of natural feeding in the form of a 100 % silk worm with a value of 0.04 mg L^{-1}. The combination of feeding greatly affects the moulting acceleration rate. The decrease in moulting intensity is caused because the feed absorbed by the shrimp is not all for the moulting of the shrimp body, it is in accordance with the Kibria (2010) statement which states that moulting can decrease because the absorption of feed used is not entirely absorbed for the molting process.

From the BNT test results above, it can be seen that P1 (100 % natural feed), P2 (25 % natural feed + 75 % artificial feed), P3 (50 % natural feed + 50 % artificial feed), P4 (75 % natural feed + 25 % artificial feed), and P5 (100 % artificial feed). Each treatment showed a significantly different moulting increase. Allegedly the highest moulting acceleration process in the P2 treatment due to artificial feeding in the form of more cake has the value of calcium and phosphorus content while with natural feed silk worm is more affected the giant prawns growth (Suryati, 2002). Absorption of nutrients in the process of shrimp moulting not fully into energy, can also to form new body tissues, thus accelerating peeling kerapas prawns stadia V.

This is reinforced by a statement from Hadie (2002) which states that the calcium content required for moulting process is found in cake feed as much as (1.47 %) and phosphorus (2.08 %). Appropriate giving is in treatment 2 (P2) which is with the right combination of 25 % natural feed and 75 % feed cake.

3.2. The Absolute Growth of Giant Prawns

Absolute Growth or Growth Rate is the difference between wet weight at the end of the study and wet weight at the beginning of the study on giant prawns during treatment. Based on statistical analysis of each population mean value of ANOVA treatment (one way F test) at (P <0,05), it was found that the treatment was different in percentage of cake feed a real effect on the absolute weight growth of giant prawns. Shown with the following chart diagram:

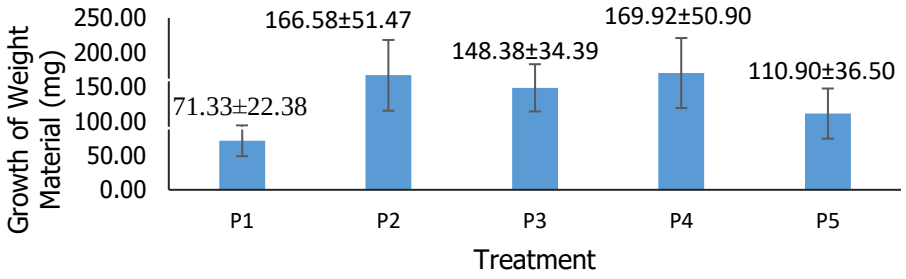

Figure 2. The Absolute Weight Growth of Giant Prawns

The result of graphic shown that at the fourth treatment 75 % natural feed and 25 % feed the highest growth occurs, from those data can be spelled out from analysis of variance (ANOVA) for the growth could see in the table 3 bellow:

Table 3. Analysis of Variance in the Absolute Growth of Giant Prawns

Sources of Diversity	db	JK	KT	F. Calculation	F. Table 0.05	F. Table 0.01
Treatment	4	28 068.6	7 017.16	4.25*	3.06	4.89
Error	15	24 769.4	1 651.29			
Total	19	52 838.1				

Description: Different Real (*)

The result from analysis of variance above showed that Calculation > from Table, then continued with BNT test could be seen in the Table 4, as follows:

Table 4. BNT test at the Growth of Giant Prawns

Treatment	The Average	P1 71.33	P5 110.90	P3 148.38	P2 166.58	P4 169.92	Notation
P1	71.33	0.00	0	0	0	0	a
P5	110.90	3957*	0.00	0	0	0	b
P3	148.38	77.05*	37.48*	0.00	0	0	c
P2	166.58	95.25*	55.68*	18.20*	0.00	0	d
P4	169.92	98.58*	59.01*	21.53*	3.34*	0.00	e

Obtained the growth value at days 30 in the treatment P1 (100 % natural feed), P2 (25 % natural feed + 75 % artificial feed), P3 (50 % natural feed + 50 % artificial feed), P4 (75 % natural feed + 25 % artificial feed), and P5 (100 % artificial feed). Each treatment shown the the weight gain was significantly different that the combination of natural and artificial feeding was very appropriate for the level of adaptation of prawns from natural feed to artificial feed. The presence of attractants in the mixture of cake feed ingredients can stimulate the level of appetite of prawn. According to Effendi et al. (2017) states that the attractiveness of a mixture of ingredients used in

the manufacture of cake feed made from animal raw fish kites. The higher levels of attractiveness increasingly affect the level of appetite of the prawns itself in its growth (Katili, 2009).

The analysis of variance above shown that the combination of natural feeding of silk worms and artificial feed cake had a significant effect on the absolute weight growth of giant prawns. Showed that the result of F.Cal 6.69 > from F.Table 0.05 from the value 3.06 and F. Table 0.01 with value 4.89. The treatment P4 (75 % natural feed + 25 % artificial feed) able to increase the absolute growth of this giant prawns show the needs of the food being eaten fulfilled and the prawns response was very good, this can be seen when the natural feeding of prawns silk worm directly respond and do not need a long time about 45 min to 60 min of feed was finished in the bottom of waters media research maintenance. If the feed consumed by giant prawns many amount, then the optimal energy produced for both growth and for maintenance (Zaidy, 2008).

The increase that occurs in natural feeding of silkworm and artificial feeding in cake form are appropriate combination for the giant prawns adaptation that go from natural feeding to artificial feeding, so as to accelerate the absolute growth (Sutarjo, 2018). While, cake feeding has complex value in a complete feeding ration in the nutrition content that has been determined. Based on Setiawati (2004), the balance of protein components in the feed is main factor in affecting growth and health. The natural feeding of silkworm that has protein content of 57 % used in this research can meet the needs of protein in the body of giant prawns so it can produce absolute growth on the average that is good sufficient to grow for giant prawns at stadia v.

3.3. Growth in Length of Giant Prawns

Growth was length in unit or size accretion, growth in length rate of giant prawns on 30th day of maintenance at all treatments ranged between 72.92 mg to 101.69 mg. Growth in length can be seen in the picture as follows:

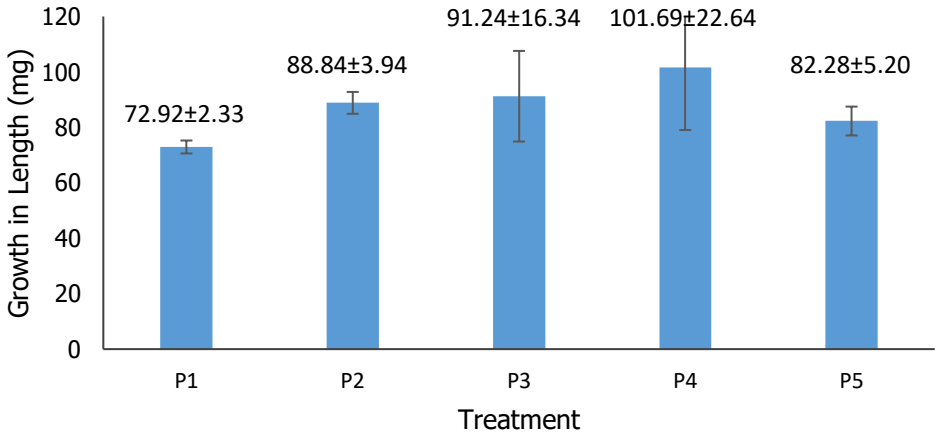

Figure 3. Growth in Length of Giant Prawns

It can be seen from the picture above that the 4th treatment (P4) is the highest treatment with value 101.69 mg with combination of natural feeding in the form of silkworm (75 %) with artificial feed in the cake form (25 %). From the data can be interpreted with analysis of variance.

The analysis of variance results (ANAVA) for growth in length of giant prawns with combination feeding of silkworm and artificial feeding in different cake form can be seen in Table 5:

Table 5. Analysis of Variance in Length

	db	JK	KT	F. Calculation	F. Table 0.05	F. Table 0.01
Treatment	4	1 827.08	456.77	2.76^{ns}	3.06	4.89
Error	15	2 484.49	165.63			
Total	19	4 311.58				

Description: ns = the effect is not real

The analysis of variance result above showed that the combination of natural feeding in the form of silkworm and artificial feeding in the cake form with different treatments had no significant effect (ns) toward growth in length of giant prawns' larvae because FCal 2.76< from Ftable 0.05 with level 3.06 and Ftable 0.01 with level 4.89. It is assumed that the combination of different feeds had no significant effect toward growth rate of giant prawns' larvae length on the feed given. It is suspected growth acceleration of absolute weight with growth acceleration of absolute length is directly proportional to P4 75 % natural feeding + 25 % artificial feeding, because growth factor can be seen from both of them. The growth in length and weight of giant prawns can be known by measuring the length/weight of giant prawns at the beginning of maintenance (Suryati and Tanriuola, 2013).

From the results above, it can be concluded that the growth in length of giant prawns always followed by maintaining the growth in weight of giant prawns. It is known that the absolute and relative growth rates of giant prawns given more tubifex feeding or in P4 compared with other treatments of 101.69 mg. The high rate of growth in this 4th treatment, influenced by the complex content in the natural feeding of silkworm is needed by the giant prawns with appropriate combination and with the addition of artificial feeding in the form of cake for the giant prawns that are still in the adaptation to artificial feeding (Sutarjo, 2018). The Giant Prawns Needs of Protein is bigger than other organisms, the function of protein in the giant prawns' body, among others, to maintain the tissue, the formation of tissue, to replace the damaged tissue and growth (Yuwanta, 2010). The giant prawns need of protein is different in each stadia, the protein needs is bigger than after adult in the stadia v, this is due to giant prawns larvae growth stadia is bigger than the adults. The protein in feed is primarily for growth, maintenance, and as a source of energy for Crustacea (Kompiang and Ilyas, 1988). Growth and stadia affect protein feed needs for giant prawns. In stadia the protein needs of larvae is higher than the adult stage.

3.4. The quality of water

The quality of water has more important meaning for prawns' life in both growth and changing shell process. Stated good quality water is containing adequate sufficient oxygen, physical and chemical properties. Unqualified water quality can cause decreasing in the production and the profits. Many properties of water, only a few are the key variables in determining the water quality maintenance media, among others temperature, pH, and DO, and metabolism disposal (Tidwell and Coyle, 2008). During the research, the measurement of water quality was done twice a day, in the morning and afternoon, the water quality observation during maintaining giant prawns' larvae are including temperature, degree of acidity (pH), and dissolved oxygen (DO). The result of water quality measurement for 30 days from maintenance of giant prawns' larvae. The observation results of water quality for giant prawns can be seen in table 6:

Table 6. The Water Quality of Giant Prawns

The observation results of water quality			
Treatment	Degree (˚C)	pH	DO (mg L^{-1})
P1	23–29	7.3-8.9	4.5–9.0
P2	23–29	7.7-8.8	4.3–8.2
P3	23–29	8.1-8.9	4.0–8.0
P4	23–28	7.8-8.8	4.1–8.2
P5	23–29	7.8-8.9	3.6–8.7
Range	20–30	7.0-8.9	3–7

The average of temperature on media maintenance of giant prawns' larvae during the research was 23 ºC to 29 ºC. The temperature range can still be tolerated for the giant prawn larvae maintenance. According to Tidwell and Coyle (2005), directly or indirectly, water temperature has more important role in determining the growth and survival of the nourished larvae. Optimum temperatures for prawns growth ranging from spawning, egg hatching, to adulthood are 20 ºC to 30 ºC (Khairuman, 2004). According to Hadie and Hadie (2002), the temperature was also very influential on the growth of prawns. The optimal temperature for prawns was 29 ºC to 30 ºC. At temperatures too low the prawns can not grow well because the moulting process takes a pretty warm time.

The results of pH observation during maintenance are relatively stable and were in the normal range, since the 5th conduction is done after feeding so that the water in the aquarium is reduced by 1/3 part of the initial volume. The change of water was also done for water resilcuration in the media so that water quality in the optimum medium and does not cause shrimp stress due to poor water quality (Buckle et al. 1985). The addition of water as much as water is removed from each maintenance medium. The kiss is done to remove the remains of feed and metabolism as well as replacing the water so as to avoid the presence of toxic gases such as H_2S and Ammonia. If the pH was too high it will interfere with prawns life and the growth of natural food, even the appetite may decrease and the growth becomes slow (Soetomo, 2002). During the study the pH was found to be between the range of 7 308.9 which can still be tolerated by giant prawns. According to D'Abramo (2006), the optimal pH value in the maintenance of prawns ranged from 7.0 to 8.5. In aquatic environments with a pH of less than 6.5 or more than 9.5, giant prawns can still survive.

The observations showed that dissolved oxygen levels during the 30 days maintenance period of giant prawns ranged from 3.6-8.7 mg L^{-1}. The dissolved oxygen content in the water must meet the requirements to support the growth and a viable life for the maintained prawns. The dissolved oxygen content can support growth in the range of 3-5 mg L^{-1} (D'Abramo, 2006).

4. Conclusion.

Feeding of cake and natural food has significant effect on absolute weight growth rate (GR) of giant prawn larvae. As for the moulting acceleration with a combination of natural and artificial feeding effect was very different real. The effect of combination of feeding on growth was very significantly different in treatment 4 where with dose 75 % natural feed and 25 % artificial feed. While for moulting acceleration significantly indicated by treatment 2 with a dose of 25 % natural feed and 75 % artificial feed.

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