Effects of probiotics (rabal) with different doses on the survival, feed conversion, and growth of giant prawns (*Macrobrachium rosenbergii*)

A L Dachi¹, A A Muhammadr*¹, I Sahidhir², D F Putra¹, Z A Irwan³

¹Department of Aquaculture, Faculty of Marine and Fisheries, Universitas Syiah Kuala, Indonesia
²Center for Brackishwater Aquaculture Department, Ujung Batee, Aceh Besar Indonesia
³Department of Marine Science, Faculty of Marine and Fisheries, Universitas Syiah Kuala, Indonesia
*Corresponding author: Muhammadr@unsyiah.ac.id

Abstract. This study aims to determine the effect of the best RABAL probiotic dose on the media for the maintenance of giant shrimp larvae (*Macrobrachium rosenbergii*) on the survival, feed conversion, and growth. This research was conducted from March to April 2019 at Brackish Water Aquaculture (Balai Perikanan Budidaya Air Payau, BPBAP) Ujung Batee, Aceh Besar district. Province of Aceh. This study used a Completely Randomized Design (CRD) with 4 levels of treatments and 4 repetitions. The treatments used of RABAL with a dose (A) 0 ppm, (B) 75 ppm, (C) 150 ppm, and (D) 225 ppm. The frequency of administration of RABAL was once a day. The giant prawn larvae used was a larvae stage with an average weight of 0.05 g/larvae. Based on the result of ANOVA test the best value was obtained a treatment D (225 ppm) with absolute weight growth value of 0.16 g ± 0.003, absolute growth length of 1.30 cm ± 0.053, specific growth rate 5.08 ± 0.043, survival rate 96.25 ± 4.787 and feed conversion ratio 0.83 ± 0.013, respectively. The result of this research showed that the administration of RABAL with different doses into maintenance media had a significant effect (P<0.05) on the growth and feed conversion ratio of giant shrimp larvae but did not significant influence (P>0.05) on the survival rate of giant shrimp larvae.

1. Introduction
Shrimp is the fourth Indonesian fishery export commodity under the commodity of tuna, skipjack tuna, and mackerel tuna which ranks third. Indonesia is one of megadiversity country that has abundant of shrimp and fish resources [1,2,3]. This can be seen from the data on Indonesian shrimp exports to overseas in 2016 the volume of shrimp exports reached 196,623 tons, while the export volume of tuna, skipjack tuna, and mackerel tuna reached 206,553 tons [4]. Giant prawns (*Macrobrachium rosenbergii*) are one of the species of native Indonesian freshwater shrimp. Giant prawns are the most popular shrimp from all freshwater shrimp due to their large body size and high economic value both in the domestic and foreign markets [5].

Hapsari *et al.* [6] said that in order to increase shrimp production by increasing the growth rate by adding probiotics in feed. Other researchs also state that uses probiotic in aquaculture waste not polluting the pond environment, the quality of soil and water remains viable for the life of cultivated shrimp so that harvest failure does not occur [7]. Probiotics are defined as additional forms of feed like a whole microbial cells (which do not have to live) that are...
beneficial to their hosts by balancing their microbiological conditions, increasing feed nutrition, stimulating immunity to pathogens and improving environmental quality [8].

RABAL Probiotics are products of fermentation between yeast and lactic acid bacteria. Lactic acid bacteria (LAB) are naturally found in food ingredients in meat, milk, fruits, vegetables and fermented products [9]. Giving probiotics in application in the world of fisheries, probiotics as decomposers can be used either directly by being spread into water or through the mediation of live food [10]. In this study, the probiotics were used by spreading into the water. The purpose of this study was to determine the effect of RABAL probiotics with the best doses on the growth, feed conversion and survival of giant prawns, (Macrobrachium rosenbergii).

2. Material dan Methods

2.1. Site and Time
This research was conducted at Balai Perikanan Budidaya Air Payau (BPBAP) Ujung Batee, Aceh Besar district, Aceh. The study runs over 28 days starting from March to April 2019.

2.2. Experimental Design
This research used experimental method with Completely Randomized Design (RAL) with 4 treatment levels and 4 replications. The tested treatment was the doses difference of RABAL. The placement of the treatment container was placed randomly. The treatments were:
Treatment A: without adding RABAL (control)
Treatment B: adding RABAL 75 ppm
Treatment C: adding RABAL150 ppm
Treatment D: adding RABAL225 ppm

2.3. Procedure of Research
Culturing of RABAL. The raw materials used to culture RABAL were coconut water, pure water, molasses and RABAL (active microbes). RABAL started from the provision of water of 9 L, molasses of 0.5 Liter, and coconut water of 0.25 L and 0.25 liters of RABAL larvae. Culturing was done by curing for 4 days in order to occur fermentation process. The frequency of giving RABAL was 1 time a day is noon at 1:00 PM [16]. Preparation of culture process. The container used in this study was a rectangular plastic container with a volume of 72 liters. The container preparation started from cleaning the container clean of dirt. Each container had an aeration hose for oxygen supply.

2.4. Parameters
2.4.1 Total weight and total length. The weight and total length of 5 giant prawns randomly on each treatment were measured individually. The weight of giant prawns were done by weighting using an analytical balance. Total length of giant prawns were done using digital calipers (in mm). The weight and total length of giant prawns were be calculated by using formula [12]:

\[ W = W_t - W_o \]
\[ L = L_t - L_o \]

2.4.2 Specific Growth Rate (SGR). The daily growth rate (SGR) is the percentage of weight gain of fish each day during culture, the daily growth rate is indicated in percentage units (%). The daily growth of giant prawns were calculated by using formula [13, 19, 20, 21]:

\[ SGR = \frac{\ln W_t - \ln W_o}{T} \times 100 \]

2.4.3 Calculating survival percentage (SR). Survival rate was calculated by using formula [14, 19, 20, 21]:

\[ SR = \frac{N_t}{N_o} \times 100 \]

2.4.4 Feed conversion ratio (FCR). Conversion of observed feed to calculate feed conversion and were calculated by using formula [13]:

\[ FCR = \frac{W_t - W_o}{N_t} \]
2.5. **Data Analysis**

The data obtained were analysed by ANOVA (analysis of variances) with post hoc Duncan comparison of mean scores using SAS software.

2.6. **Water Quality Parameters**

Water quality parameters were carried out every 7 days, morning and evening. Measuring these water quality parameters includes: temperature, DO, pH and salinity.

3. **Results and Discussion**

The results showed that administration of RABAL significantly increased the growth and feed conversion (p < 0.05). The survival of giant prawns given RABAL tended to increase even though statistically insignificant (p > 0.05). The growth of absolute weight (W) of giant prawns in all treatments increased with rising doses of RABAL probiotic given during maintenance. The highest value was the treatment dose of 225 ppm of 0.158 g and the lowest was in the treatment without RABAL of 0.063 g (Figure 1). The absolute length of giant prawns in all treatments increased with rising doses of RABAL probiotic (Figure 2). The best (lowest) FCR value was found in treatment D (dose 225 ppm) of 0.83 (Figure 3). The average value of the survival rate from dose 0 ppm (control) to 225 ppm ranges from 90-96%. The chart showed that there was an increase in SR as the RABAL dose increases even though it is statistically insignificant.

**Table 1.** Data of weight growth, length growth, specific growth rate, survival and feed conversion ratio of giant prawns (*Macrobrachium rosenbergii*)

| Treatment | Research Parameters |
|-----------|---------------------|
|           | W       | L       | SGR     | SR       | FCR     |
| 0 ppm     | 0.063±0.003<sup>a</sup> | 0.94±0.025<sup>a</sup> | 2.91±0.082<sup>a</sup> | 90.00±4.08<sup>a</sup> | 2.07±0.085<sup>a</sup> |
| 75 ppm    | 0.085±0.003<sup>b</sup> | 1.11±0.025<sup>b</sup> | 3.55±0.068<sup>b</sup> | 92.50±5.00<sup>a</sup> | 1.53±0.047<sup>b</sup> |
| 150 ppm   | 0.109±0.002<sup>c</sup> | 1.18±0.020<sup>c</sup> | 4.12±0.043<sup>c</sup> | 93.75±4.78<sup>a</sup> | 1.20±0.021<sup>c</sup> |
| 225 ppm   | 0.158±0.003<sup>d</sup> | 1.30±0.053<sup>d</sup> | 5.08±0.043<sup>d</sup> | 96.25±4.78<sup>a</sup> | 0.83±0.013<sup>d</sup> |

The measurement of water quality parameters in this study was temperature and salinity (Table 2). Water salinity in this study was 0 ppt and the temperature ranged from 28.3-29°C. Water quality measurements were carried out every 7 days to keep the environment under control every week.

**Table 2.** Water quality parameters

| Parameters | Treatment |
|-----------|----------|
|           | A        | B        | C        | D        |
| Temperature (°C) | 28.3-29 | 28.5-29 | 28.5-29 | 28.5-29 |
| DO (mg/L)   | 4.3-5.6  | 4.3-5.5  | 4.5-5.7  | 4.6-5.8  |
| pH         | 7.7-7.8  | 7.6      | 7.5-7.6  | 7.5      |
| Salinity (ppt) | 0       | 0        | 0        | 0        |

Weight and length growth of giant prawn increased with the addition of RABAL probiotic doses. Giving RABAL at certain doses can increase growth rate and weight gain of giant prawn (*Macrobrachium rosenbergii*) compared without giving RABAL. Pitt *et al.* [15] stated that during the fermentation process, lactic acid bacteria will produce metabolite that cause changes in taste and shape of food and inhibit the growth of pathogenic bacteria. Explanation of [8] the mechanism of probiotic bacteria action which can be a source of macro and micro...
nutrients (including proteins), bacteria are also a single cell protein. Therefore, RABAL probiotics are able to improve the nutrient composition and help the growth of shrimp. Based on the Duncan test results, the treatment dose of 225 ppm showed the best results. According to research conducted by Muhammadar et al. [18], RABAL probiotics with high concentrations gave a positive influence on the growth and survival of tiger shrimp. Feed conversion ratio is defined as a comparison between the amount of feed consumed and the weight gain of fish or shrimp. Feed conversion ratio is an illustration level of feed effectiveness of feed given to the growth response obtained [19, 20, 21]. The results of the ANOVA test conversion value of giant prawns with RABAL application treatment were better in utilizing feed. The best (lowest) FCR value is found in the treatment dose 225 ppm of 0.8. The low value of feed conversion is suspected because the role of probiotic bacteria found in RABAL is able to improve feed efficiency by helping enzymes in the process of digestion, nutrient absorption and feed consumption. According to Vazquez-Juarez et al. [17], the use of probiotics containing lactic acid bacteria and yeast in fish farming proved to be beneficial and influential on growth performance, feed efficiency and digestibility of organic material and protein.

The highest survival of giant prawns was obtained by probiotic treatment of 225 ppm by 96%, while without probiotics it was 90%. Based on the Duncan test results, the administration of RABAL probiotics had insignificant effect (p> 0.05) on the survival of giant prawns. Because there was no significant difference between the treatment of the addition RABAL probiotics with the control treatment (without the addition of RABAL probiotics). So this presumably due to the low density of spreading giant prawns during the study, so that shrimp had a wide range of space and little competition. Density of giant prawns in this study was 20 larvae/container with volume 72 liters. In addition, feeding crumble with a protein composition of 35% in each treatment so nutrients for giant shrimp are fulfilled and according to SNI. According to SNI (2006) in Pramana et al. [18], the protein requirement for giant prawn larvae is a minimum of 32%. It provides proper nutritional value in maintaining giant prawns and can help the survival of giant prawns, so there is no significant difference between treatments.

According to Boyd [22] water quality is the feasibility of waters to support the life and growth of aquatic organisms which values are expressed in a range of certain values. The range of water quality parameter values for the maintenance of giant prawn larvae during the study is generally still within the tolerance range of giant prawn larvae so these factors do not restrict the growth and survival of giant prawn larvae. According to Spotss [23] the optimal range of water temperature in the maintenance of giant prawns is between 26-30°C. The temperature on the maintenance media during the research is still in the optimal range for the growth of giant prawns, which is around 28.3-29°C. Giant shrimp has two habitats, namely salinity brackish water 5-20 ppt (larvae-juvenile stage) and fresh water (juvenile-adult stage). Water salinity in this study is 0 ppt. The optimal dissolved oxygen content for giant shrimp ranges from 3-7 mg/liter and causes stress if below 2 mg/liters [24]. The optimum pH range for growth and survival of giant prawns is around 7.0-8.5.

4. Conclusion
Based on the results of the research that has been carried out, it can be concluded that the administration of RABAL probiotics fruit produced by spontaneous fermentation given through water media at different doses had a significant effect (p<0.05) on the growth and feed conversion ratio, but no significant effect on the survival rate of giant prawn larvae (Macrobrachium rosenbergii) (p>0.05). The best RABAL dose in this study was at a dose of 225 ppm.

References
[1] Rizwan T, T K Nasution, I Dewiyanti, S A E Rahimi, D F Putra 2017 AACL Bioflux 10(5):1180-1185
[2] Muchlisin Z A, N Nurfadillah, I I Arisa, A Rahmah, D F Putra, M Nazir, A Zulham 2017 Biodiversitas 18(2): 752-757
[3] D F Putra et al 2018 IOP Conf. Ser.: Earth Environ. Sci. 216 012022
[4] Badan Pusat Statistik 2016 Statistik Sumber Daya Laut dan Pesisir Subdirektorat Statistik Lingkungan Hidup Jakarta
[5] Priyono, S B Sukardi, Harianja B S M 2011 Jurnal Perikanan (Journal of Fisheries Sciences) 8(2): 78–85
[6] Hapsari T, W Tjahjaningsih., M A Alamsyah, H Pramono 2016 Journal of Marine and coastal Science 5(3): 109-118
[7] Valsamma J, M Haseeb, S Ranjit, A Anas, I S Brigh Singh 2014 Journal of Fisheries International 9(1): 5-14
[8] Verschuere L, Rombaut G, Sorgeloos P, Verstraete W 2000 Journal of Fisheries International 9(1): 5-14
[9] Sarkono L, Sembiring, E S Rahayu 2006 Sains dan Sibernatika 19(2): 223-242
[10] Irianto A 2007 Potensi Mikroorganisme: Di Atas Langit Ada Langit.
[11] Sahidhir I, Wahyudi, Nur A 2014 Jurnal Akuakultur Indonesia 22-26 pp
[12] Zonneveld N, E A Huisman, J H Boon 1991 Prinsip-prinsip Budidaya Ikan 318 p
[13] Kusriani P, Widjanarko, Rohmawati N 2012 Jurnal Penelitian Perikanan 1(1): 36–42
[14] Muchlisin Z A, Yulvizar C, Fadli N, Jalil Z, Sciences N 2016 Journal of Biology & Biology Education 8(2): 172–177
[15] Pitt W M, Terence J H, Ron R H 2000 Journal of Food Protec. 63(7): 916-920
[16] A A Muhammadar et al 2018 IOP Conf. Ser.: Earth Environ. Sci. 216 012031
[17] Vazquez-Juarez R, Ascencio F, Andlid T 1993 Can. J Microbiol 39: 1135-1141
[18] Pramana A, Agustono, Tri N 2017 Journal of Aquaculture and Fish Health 7(1):18-24
[19] Putra D F, M Fanni, Z A Muchlisin, A A Muhammadar 2016 AACL Bioflux 9(5): 944-948
[20] D F Putra et al 2018 IOP Conf. Ser.: Earth Environ. Sci. 216 012005
[21] Putra D F, L Armaya, S A E Rahimi, N Othman 2019 BIOTROPIA 26(2): 136-142
[22] Boyd C E 1990 Water Quality in Warm Fish Ponds for Aquaculture 482 p
[23] Spotts D 2001 Freshwater and Marine Aquarium 4(7): 32-34 & 74-75
[24] New M B 2002 Farming freshwater prawns a manual for the culture of the giant river prawn Macrobrachium rosenbergii