The effect of probiotics (RABAL) on application in diet with different doses on growth, survival and feed conversion of Barramundi (*Lates calcarifer*)

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Abstract. The study aimed to determine the effect of RABAL probiotics with different doses to improve Barramundi growth, survival and feed conversion. This research was conducted from March to April 2019 at Balai Perikanan Budidaya Air Payau. This study uses a Completely Randomized Design (CRD), which consists of controls namely without the administration of probiotics and 3 treatments given with various doses of probiotics, namely 10 mL / 100 gr feed, 20 mL / 100 gr feed, 30 mL / 100 gr feed. Based on the best ANOVA test results at the treatment is 20 mL / 100 gr with absolute weight growth of 3,09 ± 0,27, absolute length growth of 2,52 ± 0,09, specific growth rate of 4,5 ± 0,20, survival 99 ± 4,79, and feed conversion ratio 0,90 ± 0,07. The results of the study showed that different dosages of RABAL showed significantly different results (P <0,05) on absolute weight, absolute length, specific growth rate, survival and feed conversion.

1. Introduction
Barramundi production in Indonesia in 2017 amounted to 25,051 [1]. Production of Barramundi comes from fishing and cultivation. But most of the production comes from cultivation. The success factor of cultivation lies in the seed. One of the characteristics of a good seed is that it is free from pathogenic microbes. These pathogenic microbes can cause diseases in aquaculture fish so that the survival of fish that is cultivated is low so fish production decreases. One alternative that effectively inhibits the growth of pathogenic bacteria is to provide probiotic bacteria as antagonist agent [2].

Cultivation production can be increased by adding probiotics. Probiotics are defined as additives to improve feed and water quality. Addition of probiotics is useful for reducing chemical parameters such as nitrates (NO₃), nitrite (NO₂), sulfate (SO₄) and ammonia (NH₃), this can also cause pH and DO water to stabilize [3]. Probiotic bacteria are usually applied with two types, namely through the environment and oral.

The probiotic used in this study was RABAL probiotics. Yeast Lactic Acid Bacteria or RABAL is one method of utilizing microbes by fermentation with the aim of healthy feed and water. Bacterial fermentation by adding molasses as a bacterial food will produce lactic acid. Lactic acid bacteria (LAB) produce antimicrobials, sugar polymers, sweeteners, aromatic compounds, vitamins or enzymes that are probiotic [4]. Lactic acid bacteria can suppress the population of pathogenic bacteria, reduce ammonia, sulfides and other toxic gases so that the aquatic environment can be stable [5].
In this study the administration of probiotics was given through oral or feed, because the addition of probiotic bacteria into feed can cause an increase in enzyme activity in the digestive tract which can increase digestibility [6]. Proper dosage application of probiotics is one of the main determinants in fisheries production.

2. Materials and Methods

2.1 Experimental design

This study used a Completely Randomized Design (CRD) with a level of 4 treatments and 4 repetitions, namely 0, 10%, 20%, 30% (volume / weight). The treatment tested was the difference in RABAL concentration. Placement of treatment containers is randomly placed.

The treatments tested were:

Treatment A : Feed without RABAL
Treatment B : Feed with RABAL 10%
Treatment C : Feed with RABAL 20%
Treatment D : Feed with RABAL 30%

2.2 Culturing of RABAL

Tools and materials used in RABAL fruit culture are chemical beakers, and 10 L bottles. Materials used are coconut water, pure water, molasses and RABAL fruit (active microbes). RABAL culture begins with a supply of 9 liters of water, 0,5 liters of molasses, air of 0,25 liters of coconut, RABAL of 0,25 L. The culture is carried out by maturation for 4 days so that the fermentation process occurs.

Container and Seed Preparation
The container is cleaned of dirt after that the container is filled with water through an existing pump channel. The container used in this study was 40x60x60 cm³. Test fish used in this study were 4-5 cm Barramundi seeds with stocking densities of 20/100 liters. Barramundi seeds were obtained from the Ujung Batee Brackish Aquaculture Fisheries Center (BPBAP), Aceh Besar.

2.3 Seed maintenance

Given food in the form of artificial food with 40% protein content. This is done by spreading feed at each aeration point in the container so that the biota that is kept has the same opportunity to eat. Frequency of giving food 2 times a day at 08.00 and 16.00 WIB.

2.4 Measurement of seed weight and length

The average length of fish seed is done using calipers. Fish seed weight was carried out by weighing with analytical scale, each seed was taken in 10 samples randomly in each treatment.

2.5 Water quality measurement

Measured water quality every 7 days, morning and evening. Required air quality parameters: temperature, sanitation, DO, and pH. Water samples from containers for measurement purposes.

2.6 Parameters research

Weight Gain (WG)

Absolute weight gain is the difference in the total weight of the shrimp body at the end and beginning of maintenance. Calculation of absolute weight gain used the following formula:

\[ W = W_t - W_0 \]

Information:

\( W \) = Absolute weight gain (g)
\( W_t \) = Fish weight at the end of the study (g)
\( W_0 \) = Fish weight at the beginning of the study (g)
Length Growth (LG)

Calculation of absolute length increment (L) as follows:

\[
L = L_t - L_0
\]

**Information:**
- \( L \) = Absolute length increase (cm)
- \( L_0 \) = Fish body length at the beginning of the study (cm)
- \( L_t \) = Fish body length at the end of the study (cm)

Specific Growth Rate (SGR)

Specific growth rate is the percentage of shrimp weight increase every day during maintenance, the daily growth rate is shown in units of percentages (%). The daily growth of fish / shrimp will be calculated by the formula presented by namely:

\[
LPS = \frac{\ln(W_t) - \ln(W_0)}{T}
\]

**Information:**
- \( LPS \) = Specific growth rate (%)
- \( W_t \) = Test fish biomass at the end of the study (g)
- \( W_0 \) = Test fish biomass at the beginning of the study (g)
- \( T \) = Maintenance time (days)

Survival (SR)

Survival is calculated used the formula namely:

\[
SR = \frac{N_t}{N_0} \times 100\%
\]

**Information:**
- \( SR \) = Survival rate (%)
- \( N_t \) = Number of live fish at the end of the study
- \( N_0 \) = Number of fish that lived at the start of the study.

Feed Conversion Ratio (FCR)

Calculation of feed conversion ratio used the formula namely:

\[
FCR = \frac{F \times W_t - W_0}{W_t}
\]

**Information:**
- \( FCR \) = Feed Conversion Ratio
- \( F \) = Amount of feed given (g)
- \( W_t \) = Weight of test shrimp biomass at the end of maintenance (g)
- \( W_0 \) = Weight of shrimp biomass test at the beginning of maintenance (g).

Water Quality

Water quality was observed once a week during the study: Temperature (°C), salinity (ppt), DO (mg / L) and pH.

3. Result and Discussion

The results showed that the final weight of Barramundi was 3.41 grams up to 4.17 grams (mean 3.72 grams), the growth of relative weight was 2.10 grams up to 2.55 grams (average 2.23 grams), absolute weight 2.43 grams to 3.09 grams (average 2.67 grams), final length 6.75 cm to 6.98 cm (average 6.85 cm), growth in relative lengths of 0.50 cm to 0.53 cm (mean 0.51 cm) absolute length growth ranged from 2.25 cm to 2.52 cm (mean 2.34 cm), feed conversion ratio ranged from 1.17 to 0.90 (mean 1.06), survival ranges from 96% to 99% (average 97.5%).
Table 1. Research Parameters

| Research Parameters       | Treatment |
|---------------------------|-----------|
|                           | A (Control) | B (10%) | C (20%) | D (30%) |
| Weight Gain               | 2.43±0.14<sup>a</sup> | 2.63±0.11<sup>a</sup> | 3.09±0.27<sup>b</sup> | 2.56±0.11<sup>a</sup> |
| Long Growth               | 2.28±0.06<sup>a</sup> | 2.37±0.11<sup>b</sup> | 2.52±0.09<sup>b</sup> | 2.25±0.02<sup>a</sup> |
| Feed Conversion Ratio     | 1.17±0.05<sup>b</sup> | 1.09±0.05<sup>b</sup> | 0.90±0.07<sup>a</sup> | 1.11±0.05<sup>b</sup> |
| Survival Rate (%)         | 98±2.89<sup>a</sup> | 96±4.79<sup>b</sup> | 99±4.79<sup>b</sup> | 96±4.79<sup>b</sup> |
| Specific Growth Rate (%)  | 3.9±0.17<sup>a</sup> | 4.1±0.13<sup>a</sup> | 4.5±0.20<sup>b</sup> | 4.1±0.26<sup>a</sup> |

The results of the ANOVA (Analysis of Variant) test showed that the administration of RABAL probiotics with certain concentrations significantly affected final weight, relative weight growth, absolute weight, final length, relative length growth, absolute length and feed conversion (P <0.05). Duncan's test showed that the final weight of Barramundi, the growth of relative weight, absolute weight, final length, relative length growth, absolute length highest in the treatment of RABAL with a concentration of 20% (g/mL).

The results showed that the administration of probiotics influenced the weight growth of Barramundi. The average data on the weight growth of Barramundi can be seen in the Weight Graph. The data above shows that the highest weight gain in Barramundi during 1 month study was achieved with C treatment with a concentration of 20% (ml / g) which is 3.08 g. When probiotics are added to food or water, digestive disorders will change quickly and become an antagonist for pathogenic bacteria so that the digestive tract will absorb food better [7]. When digestion absorbs food well, weight gain in fish increases but the addition of probiotic doses does not always have a good effect on weight gain, because the higher the probiotic concentration, the greater the number of bacterial colonies and the concentration in this case. The study for weight gain in Barramundi was the addition of RABAL probiotics at a concentration of 20% (g/mL).

Probiotics have an effect on the long growth of Barramundi seeds. The best length of Barramundi seed growth was 2.52 cm in treatment C with a 20% RABAL concentration. Weight gain and length growth are indicators of the functioning of the metabolic system. The addition of probiotics can increase fish growth optimally, the energy in feed consumed by fish that exceeds or exceeds what is needed can be used by fish for growth [8].
The results showed that the specific growth rate (SGR) ranged from 3.9% - 4.5% with the best results in treatment C with an RABAL concentration of 20% (ml / gr). Probiotics when consumed by fish at sufficient doses will provide good benefits [9] so that in RABAL probiotics with a concentration of 10% and 30% (ml / gr) daily growth is low because probiotics are given less or too much so it cannot be utilized. Then in probiotics 20% (ml / gr) feed can increase growth optimally and dominate the digestive environment so as to reduce the number of pathogenic bacteria.
The results showed that the survival or SR of Barramundi was different, the highest survival was 99% in treatment C with a concentration of RABAL 20%, then in treatment A (control) 98% and in treatment B with a concentration of 10% and treatment D with 30% concentration has an SR or 96% survival rate. Probiotics do not always give positive results on testing different fish species or different pathogenic species [10]. The survival value of this study is highest in treatment C with a dose of 30% (ml / gr), which is 99%. In the study of dead fish because there is competition between individuals. This is normal because Barramundi is cannibal. Because Barramundi has greedy eating habits, this is good for growth but it is feared that it can also cause cannibalism [11].

![Figure 5. Effect of Probiotic Giving on Feed Conversion Ratio](image)

**Figure 5. Effect of Probiotic Giving on Feed Conversion Ratio**

The administration of RABAL probiotics in the overall study had a good effect because the FCR value of the container given RABAL probiotics was better than the container with the control treatment ie 1.16. However, when viewed again treatment C with RABAL 20% has the lowest FCR value of 0.91. Low FCR shows good digestibility and absorption of feed so that weight gain and growth in fish length are also good. Probiotic bacteria are very beneficial for fish metabolism, so fish can absorb feed nutrients well [10]. Because of this good absorption so that a little feed can be used properly.

**Table 2. Water Quality Parameters**

| Research Parameters | Treatment |
|---------------------|-----------|
|                     | A (Control) | B (10%) | C (20%) | D (30%) |
| Temperature (°C)    | 29.2        | 29.2    | 29.2    | 29.2    |
| Dissolve Oxygen (DO) (ppm) | 4.7   | 4.5   | 4.4   | 4.2     |
| Salinity (ppt)      | 30          | 30      | 30      | 30      |
| Power of Hydrogen   | 7.7         | 7.6     | 7.4     | 7.1     |

Water quality is very important and has a direct effect on fish life [12]. Water as a living medium for fish affects growth and survival. The temperature during the study ranged from 29°C-30°C, the temperature during the study was stable and there was never a drastic decline or increase. Salinity in the study was also stable at 30 ppt for each treatment. However, the pH and DO in this study varied, this was due to the acidic effects of probiotics but the range of numbers was still optimal for living Barramundi.
4. Conclusion

The administration of RABAL probiotics in this study affected the growth, survival and feed conversion of Burrumundi. The best concentration in this study was the addition of RABAL probiotics with a concentration of 20% (g/mL).

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