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EFFECTIVENESS OF MANGROVE LEAF EXTRACT Avicennia marina ON DAILY GROWTH OF VANNAME SHRIMP (Litopenaeus vanname)

Efektivitas Ekstrak Daun Mangrove Avicennia Marina Pada Pertumbuhan Harian Udang Vanname (Litopenaeus Vanname)

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ABSTRACT

One of the problems in shrimp farming is the high price of feed. The objective of this study was to find out the effect of the addition of mangrove extract *Avecenia marina* pada feed on the growth of vanname shrimp. The study used a completely randomized design (CRD) with 4 treatments and 3 replicates. The treatment used for growth is the addition of *A. marina* leaf extract at a dose: A (275 ppm in 500g feed), B (285 ppm in 500g feed), C (295 ppm in 500g feed), D (305 ppm in500g feed). The results of analysis of variance (ANOVA) on the growth of Vanname shrimp specific growth rate described that F value is greater than F Table, which indicates that the administration of *Avicennia marina* leaf extract has an effect on the best specific growth rate of 6.52% achieved in treatment D. The highest EPP calculation results amounted to 88.33% and Survival Rate reached an average of 97.25% for all treatments. Water quality during the study was within a reasonable range to support shrimp growth.

Key words : *Avicennia marina*, growth, vanname shrimp

ABSTRAK

Salah satu kendala dalam budidaya udang adalah harga pakan yang mahal. Tujuan Penelitian ini bertujuan untuk memperoleh data pengaruh penambahan ekstrak mangrove *Avecenia marina* pada pakan terhadap pertumbuhan udang vaname. Rancangan Acak Lengkap (RAL) dengan 4 perlakuan dan 3 ulangan dipergunakan dalam penelitian ini. Perlakuan yang diterapkan untuk menilai pertumbuhan harian yaitu penambahan Ekstrak *A. marina* dengan dosis: A (275ppm dalam 500g pakan), B (285 ppm dalam 500g pakan), C (295 ppm dalam 500g pakan), D (305 ppm dalam 500g pakan). Hasil analisa ragam (ANOVA) terhadap pertumbuhan biomassa udang vaname menggambarkan bahwa F hitung lebiih besar dari F Tabel yang memberikan gambaran bahwa pemberian ekstrak daun *Avicennia marina* memberikan pengaruh nyata pada laju pertumbuhan harian terbaik 6.52 % diperoleh pada perlakuan D. Hasil perhitungan EPP tertinggi sebesar 88.33 % dan Survival Rate mencapai rata rata 97.25 %. Pengamatan terhadap kualitas air menunjukan bahwa media air pemeliharaan dalam kondisi yang baik untuk pertumbuhan udang.

Kata kunci : *Avicennia marina*, pertumbuhan harian, udang vanname

INTRODUCTION

Vannamei shrimp (*Litopenaus vannamei*) is a fishery resource with high economic value. Fishery and marine commodities are an important source for national economic growth, with an estimated economic value of USD 250 billion per year (Putra, 2022). The value of Indonesian shrimp exports reached 241,200 tons equivalent to US$2.16 billion in 2022 (KKP 2022). The contribution of whiteleg shrimp exports in Indonesia reaches 85% (Farionita *et al.,* 2018).

There are several problematic factors in vaname shrimp cultivation such as the selling price of shrimp which is sometimes unstable, easily attacked by pathogens and the cost of feed is quite expensive (Nur, 2023). In cultivation, a common problem but reducing very expensive costs is feed which has a direct effect on the cultivation cultivar (Gusman & Cahyadi, 2015). Meanwhile, high-protein feed has a fairly expensive price compared to medium-protein feed. Therefore, an alternative addition of feed additives to artificial feed is needed so that it has a higher nutritional content and increases feed digestibility. One of them is by using Avicennia marina mangrove leaves in feed.

Mangrove plants contain beneficial bioactive compounds such as alkaloids, flavonoids, tannins, and saponins which can help increase the growth rate of whiteleg shrimp (Susanti *et al.,* 2016). Ananthavalli and Karpagam (2017) stated that mangroves are a source of carbohydrates, amino acids and minerals. According to Saimima *et al*., (2021), mangrove leaves also have the highest antibacterial compound content. The results of previous studies also stated that Avicennia sp. mangrove leaves are quite effective in increasing the growth of milkfish (Wijianto *et al.,* 2023). Furthermore, Arghifari *et al.*(2019), stated that the addition of 50% Avecenia marina mangrove leaf flour to feed can increase the growth of Srikandi Tilapia (*Orechromis auereus* x *niloticus*).

Based on the background explanation above, the purpose of this study was to determine the effect of adding Avicennia marina mangrove leaf extract to feed on the growth rate of shrimp.

RESEARCH METHODS

The research was conducted in December 2023 to January 2024 at the Brackish Water and Marine Research Laboratory, Faculty of Fisheries, Pekalongan University. This research was conducted using an experimental method *in* the laboratory (*Experimental Laboratory*). The equipment in this study included an aquarium, thermometer, salinometer, pH meter, digital scales. This study implemented a Completely Randomized Design (CRD) with 4 treatment groups and 3 repetitions. The amount given as a dose is as follows:
Treatment A = addition of 275 ppm mangrove leaf extract in 500 g of feed.
Treatment B = addition of 285 ppm mangrove leaf extract in 500g of feed.
Treatment C = addition of 295 ppm mangrove leaf extract in 500 g of feed
Treatment D = addition of 305 ppm mangrove leaf extract in 500 g of feed.

The treatment applied was based on research conducted by Linayati *et al.,* (2023b) which showed that giving *Avecenia marina* at 275 ppm/500 g of feed still showed linear values.

Container Preparation

Aquariums are used as maintenance containers in research. The capacity of the aquarium is 25 liters. The number of aquariums used is 12. To prevent pathogen contamination, the aquarium must be sterilized with disinfectant before use. Then rinse with water until clean and dry.

Preparation of Vannamei Shrimp Seeds

The test material used was vaname shrimp fry (PL30). To keep the shrimp from getting stressed, an acclimatization step was carried out by slowly inserting water into a bag containing shrimp for 15 minutes. Then the bag was directed to the surface of the water and the shrimp were released into the water media slowly.

Making Leaf Extract

The preparation uses mature dark green *A. marina* leaves and is dried until it weighs 300 g. Furthermore, the application of the 1 x 24 hour maceration method to dissolve the dried leaves by adding 70% ethanol soaking. To keep the sample perfectly mixed, stirring is done occasionally. The sample is then filtered using filter paper and thickened at a temperature of 50 C in a Rotary vacuum evaporator to obtain a concentrated sample.

Mixing Mangrove Leaf Extract in Feed

Extract Mangrove leaves are sprayed into the test feed according to the dose. After that the feed winded air dry. The dry test feed Feed can be given directly to shrimp. According to SNI 8037.1 (2014), feed shrimp given 3 times a day between morning (08.00), afternoon (12.00) and afternoon (16.00) WIB.

Test Parameters

Daily Growth Rate (DGR)

DGR is generated by applying the Chaklader *et al,* (2020) formula, namely:

$$\boldsymbol{SGR} = \frac{Ln\ final\ fish\ weight - Ln\ initial\ fish\ weight}{cultivation\ time}\ x\ 100$$

Feed Utilization Efficiency (FEE)

Formula for calculating EPP as follows:

$$\mathbf{EPP} = \frac{\mathbf{Wt - Wo}}{\mathbf{F}}\mathbf{X\ 100\%}$$

Information :

EPP : Feed Utilization Efficiency
W_t : Final fish weight accumulation (g)
W_0 : Initial accumulated weight of fish (g)
F : Accumulated feed consumed (g)

Survival Rate

The level or percentage of tilapia seed life is identified based on the formula from Chaklader *et al.* (2020), namely:

$$Percentage\ of\ Life = \frac{Accumulation\ of\ Live\ Fish\ at\ the\ End}{Fish\ at\ the\ Beginning\ of\ Research}\ x\ 100$$

Data analysis

To determine the effect of Avecenia marina extract on the specific growth rate of shrimp, the data obtained were analyzed statistically using SPSS 18. Previously, the data were checked for normality and homogeneity and continued with one-way analysis of variance (ANOVA).

RESULTS

Specific Growth Rate

Based on the calculation results, the highest SGR was in treatment D, which was 6.52%, below that was treatment C with a value of 6.30%, and treatment B with a value of 5.70% and the lowest SGR value was in treatment A, which was 5.60% or can be seen in Figure 1.

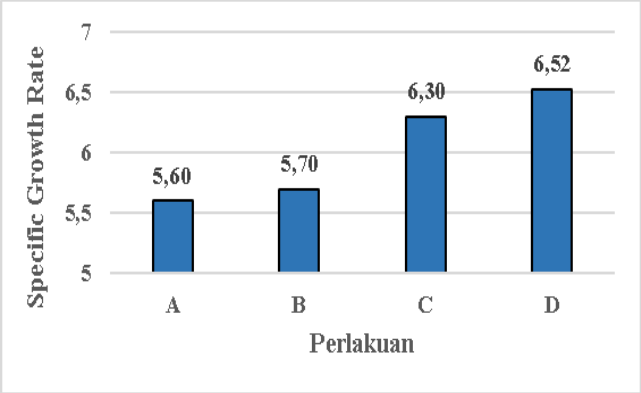

Figure 1. Specific Growth Rate (%) Graph

Feed Utilization Efficiency (FEE)

Feed utilization effectiveness (EPP) is the ratio between shrimp biomass and the amount of feed given during the maintenance period. The results of EPP can be seen in Figure 2.

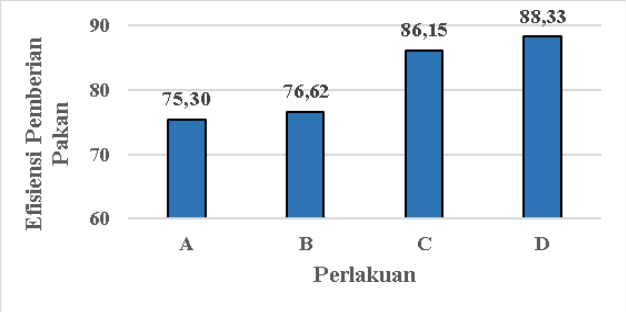

Figure 2. Efficiency Feeding (%)

Survival Rate

Survival rate is the percentage of organisms that remain alive at the end of the maintenance period (Prasetio *et al.,* 2018). The Survival Rate results can be seen in table 1.

Table 1. Survival Rate

Treatment	No	Nt	SR (%)
A	30	28	93
B	30	29	96
C	30	30	100
D	30	30	100

DISCUSSION

Specific Growth Rate

This is because the addition of mangrove leaf extract can improve the digestive system of fish, so that it can increase the optimal growth rate (Fadhillah *et al*., 2019). In the *A.marina section*, especially the leaves, there are antioxidant (flavonoids and tannins) and antibacterial (saponins and alkaloids) properties, in addition there is also a terpenoid content that helps in the process of breaking down proteins (Pariansyah, 2018). This is explained by Anggawati *et al*. (2019), with the presence of flavonoids being able to help the shrimp body to carry out its functions, especially in accelerating growth by creating a defense against pathogen attacks. Flavonoid compounds in *Avicennia marina* can maintain the health of the shrimp body so that it can grow well (Zahara & Suryady, 2018).

Alkaloids function as antioxidants so they have the potential to support growth. Busabong *et al.* (2021), stated that alkaloids are growth-supporting agents. In addition, the presence of iron (Fe) in mangrove leaves can help stimulate the formation of enzymes and minerals to increase hemoglobin (Diastari, 2019). With the core function of minerals in feed as a successor for other content in the feed to be digested properly. In addition, flavonoids are also found in the *R. mucronata* mangrove which is useful for increasing the performance of the components of the shrimp immune system (Sari *et al*., 2015). Increasing DGR performance as a strengthening output of the immune system stimulated by immunostimulants. Mangrove extract can increase immunity in shrimp (Fadhillah *et al.,* 2019). According to Manurung (2019), immunostimulants can increase the effectiveness of feed consumption and increase resistance to disease infections in shrimp so that they can accelerate the growth rate. Healthy shrimp body conditions can utilize feed optimally which is directly proportional to the periodic increase in shrimp (Uyun *et al.,* 2021)

Feed Utilization Efficiency (FEE)

Feed utilization efficiency (EPP) is the ratio between shrimp biomass and the amount of feed given during the maintenance period. According to Widyantoko *et al.,* (2015) the benchmark for feed utilization efficiency is indicated by the cultivar's ability or not in the body to utilize nutrients from the feed given. Based on Figure 2. the highest EPP results were treatment D with a value of 88.33%, followed by treatment C with a value of 86.15% and treatment B with a value of 76.62%, and finally treatment A with a value of 75.30%. From these results, it shows that the higher the dose of *Avicennia marina* given, the higher the EPP value. The EPP results are influenced by the content of Avicennia marina which contains compounds such as flavonoids, alkaloids, tannins, saponins, and terpenoids which are antioxidants that not only increase shrimp endurance but also help in the growth process by stimulating the digestive system so that there is an increase in nutrient absorption in food to an optimal level to achieve cell formation for growth (Susanti *et al.,* 2016). Coupled with the terpenoid content or the isolated results of essential oils contained in mangrove leaves, they can stimulate appetite and bile by stimulating hepatocytes in the pancreas (Syakirin *et al.,* 2023).

Saponin compounds have an effect because they can increase appetite and increase fish immunity (Astiyani *et al.,* 2022). The EPP value in this study was also influenced by the condition of good or healthy shrimp. According to Junaidi *et al.,* (2020), shrimp that are in healthy condition can be efficient in utilizing feed, and this results in increased shrimp growth. This condition is caused by the flavonoid compounds in Avicennia marina leaves which trigger the presence of antioxidant, anticancer effects and stimulate immune cells to grow (Chusniasih *et al.,* 2020). According to Santa *et al.,* (2020) flavonoids can also reduce inflammation in the intestines caused by viruses or bacterial infections so that the absorption of nutrients in the feed given can be carried out optimally.

Flavonoids support the growth of good bacteria that can be utilized by the fish digestive system so that it can digest food properly (Linayati *et al.,* 2024). One of the good bacteria that is often utilized, especially in creating better feed quality, is the *Lactobacillus casei bacteria* (Chilmawati, 2018). While Tannin can act as an immunostimulator (Rosnizar *et al.,* 2015). Immunostimulators often help in the presence of improvements in the volume of feed consumed so that the growth rate increases, the working system of the immunostimulator itself is to ward off or increase resistance to pathogenic infections that attack (Manurung, 2019).

Survival Rate (SR)

Research data shows that the SR level of whiteleg shrimp maintained for 30 days is 97.25%. This indicates that the addition of *Avicennia marina mangrove leaf extract* to the feed does not affect the SR of whiteleg shrimp. In treatments A and B, there was death although it was not significant to the SR value. While in treatments C and D, the survival rate observed produced a value of 100% or there was no death of samples in this study. The high survival rate value can be caused by the fulfillment of nutrients from the feed given so that the fish have good endurance. Furthermore, water quality conditions that are suitable for growth cause fish to be able to maintain their body condition. According to Varatharajan *et al.,* (2021) that physiological processes such as reproduction, respiration and metabolism in the shrimp body are influenced by temperature. The temperature range of 27-30ºC is a good temperature for shrimp maintenance. The next water quality parameter is salinity which affects the osmoregulation process. The salinity range of 22 - 25 ppt which is still within the feasible range will help maintain the good condition of the shrimp body.

Water Quality

The temperature obtained is at 27 - 30 °C. This is in accordance with the statement of Yudiati *et al.,* (2010) that vaname shrimp can grow well at a temperature of 27 - 32ºC. The salinity parameter measured at 22-25 ppt is in accordance with the statement of Nababan *et al.,* (2015) ranging from 10-30 ppt shrimp can grow optimally. The oxygen content parameter is still within the tolerable limit of 4 ppm. Wahyuni *et al.,* (2022) stated that the basic requirement for optimal dissolved oxygen in vaname shrimp maintenance is 4.75 mg/L. Consistency in maintaining the quality of the maintenance media that is suitable for shrimp to grow by maintaining circulation and water changes and supplemented with routine siphoning every 2 days.

CONCLUSION

The conclusions of this study include the provision of *Avicennia marina leaf extract* has a significant effect in increasing the daily growth of vannamei shrimp by 6.52% and EPP 88.33% in the treatment of 305 ppm/500 g feed.

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