Fisheries Journal, 14 (2), 684-692 (2024)
http://doi.org/10.29303/jp.v14i2.819

GROWTH RATE OF BARRAMUNDI (LATES CALCARIFER) WITH FEED ADDED MANGOSTEEN PEEL (GARCINIA MANGOSTANA) FLOUR AS A GROWTH SUPPLEMENT

Laju Pertumbuhan Ikan Kakap Putih (*Lates calcarifer*) dengan Pakan yang Ditambahkan Tepung Kulit Manggis (*Garcinia Mangostana*) Sebagai Suplemen Pertumbuhan

Tri Yusufi Mardiana*, Linayati, Diyah Ayu Rosediana, Muhammad Zulkham Yahya

Aquaculture Departement, Faculty of Fisheries, Pekalongan University

Sriwijaya Street Number 3, Bendan, West Pekalongan District, Pekalongan City, Central Java 51119

*Corresponding author: yusufihanum@yahoo.co.id

(Received April 24th 2024; Accepted June 4th 2024)

ABSTRACT

Mangosteen peel has the potential to be a growth supplement for barramundi, which has an ever-increasing consumption rate. The aim of this research is to provide literature on the use of mangosteen peel in influencing the growth of white snapper fish and to find the optimal dose that can be used to add to white snapper fish feed. Using a 15 L jar rearing medium with white snapper fish (± 6 cm) and a method using quantitative research RAL 4 treatments adding mangosteen peel to the white snapper fish feed with 3 repeaters. The doses determined in this study were: A (0g/kg feed); B (2g/kg feed); C (4g/kg feed); D (6g/kg feed). And the results obtained by the highest treatment which was able to provide the best growth was D (6g/kg feed) with an average growth of 7.35 with a daily rate reaching 2.52% with all treatments with no deaths and water quality that supported white sea bass with good, namely salinity 31 – 32 ppt, DO 7.3 – 7.9 mg/l, temperature 27 – 28 °C, and pH reaching 7.7 – 8.1.

Keywords : Barramundi, mangosteen peel, growth

ABSTRAK

Kulit manggis berpotensi sebagai suplemen pertumbuhan untuk ikan kakap putih yang memiliki tingkat konsumsi yang terus meningkat. Tujuan penelitian ini yaitu sebagai literatur pemanfaatan kulit buah manggis dalam mempengaruh pertumbuhan ikan kakap putih serta menemukan dosis yang optimal yang dapat digunakan dalam penambahan ke dalam pakan ikan kakap putih. Menggunakan media pemeliharaan toples 15 L dengan ikan kakap putih (± 6 cm) dan metode menggunakan penelitian kauntitatif RAL 4 perlakuan penambahan kulit buah manggis ke pakan

ikan kakap putih dengan 3 pengulang. Dosis yang ditetapkan dalam penelitian ini adalah: A (0g/kg pakan); B (2g/kg pakan); C (4g/kg pakan); D (6g/kg pakan). Dan hasil yang didapatkan perlakuan tertinggi yang mampu memberikan pertumbuhan terbaik adala D (6g/kg pakan) dengan rata-rata pertumbuhan 7,35 dengan laju harian mencapai 2,52% dengan semua perlakuan tidak ada kematian serta kualitas air yang menunjang ikan kakap putih dengan baik yaitu salinitas 31 – 32 ppt, DO 7,3 – 7,9 mg/l, suhu 27 – 28 °C, dan pH mencapai 7,7 – 8,1.
Kata kunci : Ikan kakap putih, kulit buah manggis, pertumbuhan

INTRODUCTION

One of the products of commercial mariculture business with a fairly fast growth and development rate is white snapper (*Lates calcarifer*) which has an ever-increasing level of consumer consumption and is a marine fish with average nutritional value and market value in the category high (Nurmasyitah *et al.,* 2018). Apart from that, this cultivation can be carried out on any scale, whether small or large, because sea bass has a body with quite high environmental tolerance (Jaya *et al.,* 2013).

As the price of artificial feed for cultivation businesses increases, it becomes increasingly expensive, therefore, to save on the use of artificial feed, we need to look for alternative ingredients to streamline feed needs and be able to help the growth process (Yahya *et al.,* 2022). An alternative ingredient that can improve feed quality is mangosteen peel. Apart from its benefits which can be used as a mixture to make feed efficient, the fruit is also easy to obtain on the market. Mangosteen peel contains several ingredients, including xanthones, flavonoids, saponins, vitamin C, carotenoids and tannins (Supomo *et al.,* 2015). The contents of mangosteen peel that influence growth are xantone, flavonoids and vitamin C.

Xanthones are known for their antioxidant properties which are more effective than vitamins A or C as substances that help restore cells in each cell wall. This is in accordance with the opinion of Aulani & Muchtaridi (2016) that xantone is an antioxidant that can repair cell damage, so it can help the growth of living creatures. Other compounds, namely flavonoids, are also a class of secondary metabolic compounds that can provide biological effects to increase growth (Irawati, 2020). Apart from that, vitamin C in mangosteen skin can influence the growth of sea bass because it can help the metabolic process (Fitriani & Akmal, 2020). So the aim of this research is to provide literature on the use of mangosteen rind in influencing the growth of white snapper fish and to find the optimal dose that can be used to add to white snapper fish feed..

METHODS

The research was carried out on 01–30 December 2022 at the Research Laboratory of the Faculty of Fisheries, Pekalongan University. Tools used during the research included jars, trays, scales, rags, air stones, aerators, rulers, water quality tools, writing tools, and cell phone cameras. Meanwhile, some of the ingredients used in this research were sea bass (± 6 cm), mangosteen peel flour, pellet feed (48% protein), egg white and sea water. The research applies a randomization method to design an entire experiment that is homogeneously distributed with the opportunity for each component of the experiment to have a chance of being influenced by the treatment or a Completely Randomized Design (CRD) (Hasdar *et al.,* 2021). There were four treatments used with three repetitions. The arrangement of the specified treatments is as follows:

A : feed without the addition of mangosteen peel flour (Control)
B : mangosteen peel flour 2 g/kg feed
C : mangosteen peel flour 4 g/kg feed
D : mangosteen peel flour 6 g/kg feed

The basis for determining the percentage of mangosteen peel flour refers to the growth of African catfish with the best results of 6 g/kg of research feed (Lukistyowati & Syatma, 2015).

Preparation of Containers and Fish

The use of a maintenance container utilizes a tube jar with a capacity of 15 L with 2/3 of the capacity of the container filled with sea water and each container is filled with 5 white snapper seeds (± 6 cm)/container (Fahrurrozi & Linayati, 2022). Before the container is used, the water used goes through a sterilization and filteration process to prevent residue and disease attacks, and the fish used undergo an acclimation process for 2-3 days before being stocked in each test container..

Test Feed Preparation

Before being given to fish, mangosteen rind flour was added to the test feed according to the required dose. The feed is given mangosteen peel flour which is previously fed with egg white as an adhesive. Next, the mangosteen rind flour is given an additional ingredient as an adhesive in the form of chicken egg white ± 2% of the accumulated feed to be used (Prasetio *et al.,* 2018), the egg white is stirred until homogeneous by mixing it gradually. Then the feed which is still wet in texture is aired until dry before being given to the white snapper fry.

Maintenance

The test feed is ready to use in pellet form with a built-in protein content of 48% as stated on the initial feed packaging container. Maintained in treatment for 28 days with feeding carried out in stages at a frequency of 3 times a day at 08.00, 12.00, and 16.00 WIB (Iskandar & Elrifadah, 2015).

Test Parameters

Absolute Growth

Determining the growth value, Manduca *et al.,* (2020) formula is used as the basis for determining in this research which:

$$\textbf{Growth = Final Biomass Accumulation (g) – Initial fish biomass (g)}$$

Survival Growth Rate

Survival Growht Rate resulting from applying the formula of Chaklader *et al.,* (2020) namely:

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

Survival Rate

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

$$\boldsymbol{Survival\ Rate = \frac{Aaccumulation\ of\ Live\ Fish\ at\ the\ End}{Fish\ at\ the\ Beginning\ of\ Research}\ x\ 100}$$

Data Analysis

Test parameter results are collected every 7 days plus the water quality obtained each day. From this data, average results are obtained which are then carried out pre-data analysis such as a normality test to see normality in the error of each data and a homogeneity test to find out whether

the variety of data obtained in a location is homogeneous or not. Continue with core data analysis using ANOVA (analysis of variance) and continue with the Tukey test to obtain the level of influence of each treatment

RESULT

Absolute Growth

The accumulated growth of white snapper fish for each treatment produced within a period of 4 weeks with the addition of mangosteen peel flour is shown in Figure 1.

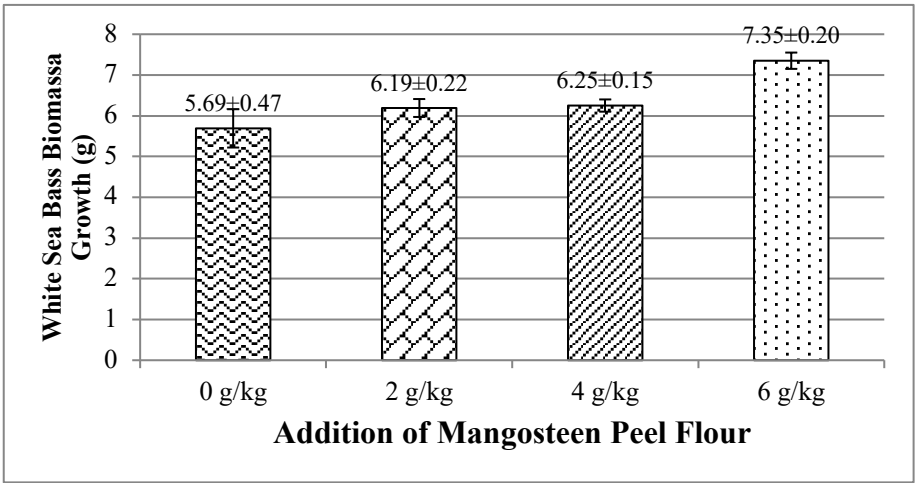

Figure 1. Growth of White Sea Bass

Based on Figure 1. The biomass growth of sea bass in each treatment showed that the most superior value was in treatment D, namely 7.35 g with the addition of 6 g of mangosteen peel flour, then treatment C was 6.25 g with the addition of peel flour. mangosteen was 4 g, then treatment B was 6.19 g with 2 g of added mangosteen peel flour and produced the lowest growth in Control treatment (A) without the addition of mangosteen peel flour, namely with a growth value of 5.69 g.

Daily Growth Rate

With the maintenance interval as a dividing element of absolute growth results, the daily rate of growth of snapper fish is produced (Sinaga & Mukti, 2022) whose data are summarized in Table 1.

Table 1. Daily Growth Rate of White Sea Bass

Replication	Treatment of Adding Mangosteen Peel Flour			
	0 g/kg	2 g/kg	4 g/kg	6 g/kg
1	2.07	2.28	2.23	2.46
2	2.13	2.34	2.28	2.58
3	2.35	2.15	2.33	2.51
Amount	6.55	6.77	6.84	7.55
Average	2.19±0.15	2.26±0.10	2.28±0.05	2.52±0.06

From Table 1, the highest daily growth data was obtained in treatment D (6g/kg feed) with an average value of 2.52% per day. Then followed by treatment C with a dose of treatment C

giving mangosteen rind flour 4 gr/kg feed 2.28%, then treatment B with a dose giving mangosteen rind flour 2 gr/kg feed obtained an average value of 2.26% and a daily growth rate of seed weight The lowest white sea bass was obtained in treatment A without giving mangosteen peel flour, obtaining an average value of 2.19%.

Survival Rate

In each treatment, the addition of mangosteen rind flour and the control treatment resulted in survival reaching 100% or during the research there was no death in any of the test fish, which means that during the research, the addition of mangosteen rind flour was able to provide an overview of the effect on the level of death and life of sea bass.

Water Quality

Observing parameters in water quality can be used as a reference for how adequate the maintenance quality of the cultivars being cultivated is. Water quality data collected during maintenance in the treatments is presented in Table 2.

Table 2. Water Quality Data Accumulation

Parameter	Observation result	Literature Quality Standards (Hassan *et al.,* 2022)
Salinity (ppt)	31 – 32	10 – 35
DO (mg/l)	7,3 – 7,9	4,0 – 8,0
Temperatur (ºC)	27 – 28	26 – 32
pH	7,7 – 8,1	7,5 – 8,3

From the results obtained, all water quality parameters from DO, pH, salinity and temperature are within water quality standards to support the life aspects of white sea bass..

DISCUSSION

Growth of White Sea Bass

Based on the results of observations made, the biomass growth of sea bass showed that the addition of mangosteen rind flour with the highest dose in treatment D (6 g/kg feed) obtained an average value of 7.35 g with a daily rate of 2.52%, then the next treatment C (4 g/kg feed) with an average value of 6.25 gr, then treatment B (2 g/kg feed) with an average value of 6.19 g, and the lowest value was treatment A (control) with an average value of 5.69 g . This result is better than research by Dahlifa *et al.,* (2016), regarding the use of mangosteen peel flour to increase growth in koi carp using a dose of 10%/kg feed and obtained an average value of 5.32 g. However, it is lower than research by Susantie & Manurung, (2021), using a dose of 15 g/kg feed and getting an average value of 10.2 gr.

The feed given to white snapper seeds is artificial feed that has been added to mangosteen peel flour, where mangosteen peel contains many bioactives which are useful for growth by improving appetite, antioxidants, maintaining fish health and increasing immunity.

This is due to the addition of mangosteen rind flour to the feed, which can affect the growth of white sea bass. Mangosteen peel contains xanthones, flavonoids, saponins, vitamin C, carotenoids and tannins (Supomo *et al.,* 2015; Poeloengan & Praptiwi, 2010). This raw compound is able to provide a protective effect and increase the metabolic work response which is ultimately

used for growth. The contents of mangosteen peel that influence growth are xanthones, flavonoids and vitamin C.

The effectiveness of xantone as a superior natural antioxidant in the skin of the mangosteen fruit has high levels of effectiveness compared to several vitamins such as vitamins A and C. , 2016). This is in accordance with the opinion of Mardiana (2011), that xantone is an antioxidant that can repair cell damage, so it can help the growth of white snapper. So, indirectly, xanthones also act as immunostimulants. Xanthones also bind to some amino acids to break down proteins into simpler ones (Prior *et al.,* 2005). This has an impact on the fish's body's metabolic process to digest food into energy and the growth process will occur more optimally. The inherent secondary metabolic properties of flavonoids can be used as potential ingredients to increase the growth of white sea bass. This is supported by the opinion of Irawati (2020), who states that secondary metabolic sources from natural ingredients that provide biological effects in supporting increased growth are flavonoids. Apart from that, the presence of flavonoid compounds in mangosteen peel can increase appetite and can stimulate the digestive bacteria Lactobacillus sp so that it can maximize additional energy changes to increase the growth of white sea bass (Linayati *et al.,* 2023).

The presence of vitamin C in the skin of the mangosteen fruit can influence the growth of sea bass because it can help the metabolic process (Fitriani & Akmal, 2020). Apart from that, collagen for fish growth must also be stimulated by the presence of vitamin C in the feed to support normal fish growth (Abadi *et al.,* 2018). With sufficient collagen in the fish's body, the fish is able to show better growth results.

In treatment B (2 g/kg feed) the average value was 6.19 g with a daily rate of 2.26% and in treatment C (4 g/kg feed) the average value was 6.25 g with a daily rate of 2.28% due to the dose The provision of mangosteen rind flour was low, thus having a less than optimal effect on the growth of white snapper fish and causing the growth of white snapper fry to be slow. This is in accordance with the opinion of Bulotio *et al.,* (2023) that if the food provided can then be eaten and utilized by the fish, the growth of the fish will also be affected.

Treatment A (Control) had the lowest average weight value, the average daily rate was 2.19% which resulted in biomass growth of 5.69 g, this was because the feed given did not contain mangosteen rind flour so there were no compounds that could increase growth. white snapper which causes the fish to be less than optimal in digesting feed.

Survival Rate (SR)

The accumulation of all fish kept alive until rearing is often called the survival rate (Firmansyah *et al.,* 2021). In maintenance in treatment and without treatment, the addition of mangosteen peel flour resulted in a survival rate of 100%. This is included in good life status because there are no deaths at all until the end of maintenance because according to Linayati *et al.,* (2022) the cultivator's life status is in good condition if its life status reaches more than 70% but if the cultivant's life status is less than 50% then his life status is bad or low.

The survival of white snapper can be influenced from within the body of the fish itself, such as the quality of fish seeds and from external aspects of the fish, including water quality, feed availability, feed quality and disease. The good quality of snapper seeds and their large enough size are factors in better environmental adaptation of snapper fish.

Apart from that, environmental factors can also influence the life status of snapper fish, namely the most prominent sector is the quality of the rearing media or water quality which supports several behaviors of white snapper fish, especially in controlling the body in adapting,

moving, looking for food and carrying out its body's metabolic functions. . Feed factors ranging from feeding to the quality, quantity and size of the feed given greatly influence the life of the fish because it must adapt to the size of the mouth and nutritional needs of the fish. (Mardiana *et al.,* 2024)

Water Quality

Water quality control is always carried out every day with the aim of ensuring that the maintenance conditions are in an optimal condition which supports the sea bass to carry out all its body functions and maintain its life. All parameters measured by reviewing Hassan *et al.,* (2022) include DO, pH, salinity, and temperature in conditions that are appropriate to the living environmental status of sea bass. These quality parameters act to help in the process of all snapper fish life during maintenance in addition to the feed factors provided such as temperature which affects the level of distribution and chemical reactions of fish in water. pH is a benchmark for the level of acidity in waters, apart from other parameters such as salinity which is always associated with the osmoregulation process or osmotic pressure of fish during the operation of their bodies and DO, which is oxygen which is the basic need for every living creature, including sea bass.

CONCLUSION

With the data sources from each treatment obtained during the research, the addition of mangosteen rind to the white snapper fish feed was able to have a real effect in providing a more optimal growth impact for the white snapper fish compared to untreated feed. The dose that provides the highest growth is the addition of 6 g/kg of mangosteen peel to feed which produces growth of 7.35 with a daily rate of 2.52% but is not able to affect the life level of white snapper and has optimal and good rearing quality for snapper white.

ACKNOWLEDGEMENT

Thank you to the student team who helped throughout the process of carrying out this research as well as the team who thought about all the concepts which ultimately resulted in research results which hopefully can be used as additional literacy about the use of mangosteen peel in the field of aquaculture.

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