

The addition of papaya leaf powder (*Carica papaya* L.) in feed to increase digestibility of milkfish fry (*Chanos chanos*)

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Abstract. The purpose of this study was to see the effect of adding papaya leaf powder with different doses to increase the growth rate and digestibility of milkfish fry (*Chanos chanos*). The method in this study used a completely randomized design (RAL) with 4 treatments each with 5 repetitions. The treatment used in this study was feed without the addition of papaya leaf powder or control treatment (A), the addition of papaya leaf powder 2% (B), 2.5% (C) and 3% (D). The feed that has been made is added with chromium which functions as an indicator of digestibility. Feeding is carried out for 40 days. The results showed that the addition of papaya leaf powder had a significant effect ($P < 0.05$) on increasing the specific growth rate, growth in absolute length and absolute weight, FCR and digestibility of milkfish fry, but had no significant effect ($P > 0.05$) on survival rate (SR). The best results in this study were shown in treatment D (with the addition of 3%/kg papaya leaf powder to the feed) showed a specific growth rate 0.93%, absolute length and absolute weight growth respectively 1.12 cm and 0.37 g, FCR 1.86%, and digestibility were 77.7%.

1 Introduction

The development of milkfish cultivation in Indonesia has increased, including in Aceh Province. Based on KKP statistical data, the production volume of milkfish cultivation in Aceh has increased over the last ten years, namely from 18,492 tons in 2012 increasing to 20,315.14 tons in 2022 [1]. This condition provides opportunities for farmers to developing milkfish cultivation business. But in cultivation milkfish, farmers often face the problem of the length of time fish farming [2]. Feed is one of the determining factors for fish survival and growth milkfish. High prices of feed ingredients such as fish meal as a source of protein are the main obstacle in fish farming activities because they cause high costs for this cultivation [3]. To decrease feed costs and improve feed quality which can increase the survival value and growth of milkfish can be done by utilizing natural ingredients that are available to be used as substitutes or additions to feed [4]. One of natural ingredient that can be used and contains nutrients is papaya leaf powder which is added to milkfish feed. Papaya leaf powder contains protease enzymes [5]. This enzyme is used to completely break down

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or decompose peptide bonds in proteins so that the proteins break down into simpler peptide bonds [6]. The addition of papaya leaf powder to commercial feed is thought to be able to enrich the enzymes in the feed. Papaya leaves contain the enzyme papain which can help break down protein so that it can increase feed digestibility and increase fish growth [7].

Previous research was conducted by [8] regarding the addition of papaya leaf powder which had a significant effect on the growth rate of length and weight of catfish (*Clarias* sp.) with the best treatment being the addition of 3.5% papaya leaf powder which resulted in growth in length and weight 2.69 g and 3.51 cm, specific weight and length 3.89 g and 5.89 cm, and FCR 0.517. Previously, [7] had also conducted research on the potential of papaya leaf powder on tilapia (*Oreochromis niloticus*) and showed that papaya leaf powder addition of as much as 2% can improve the efficiency of feed utilization in tilapia fish farming amounted to 36.65%, can increase the protein efficiency ratio amounted to 0.55%, could increase the growth rate relative to the cultivation of tilapia by 2,725%, can increase the protein content (17.98%) in the flesh of tilapia. Then, the treatment addition of papaya leaf powder 3% can increase the thickness of the flesh of tilapia (38.09%). Research on the addition of papaya leaf flour to milkfish seeds has never been carried out, therefore it is necessary to carry out this research which aims to see the effect of adding papaya leaf powder with different doses to increase the growth rate and digestibility of milkfish fry (*Chanos chanos*).

2 Materials and methods

2.1 Time and places

This research was carried out at the Hatchery and Breeding Laboratory, Faculty of Marine and Fisheries, Universitas Syiah Kuala, Banda Aceh for 40 days, starting from February 25 to March 10 2023.

2.2 Materials and equipment

The materials and equipment used for this research were milkfish fries, buckets, aerators, scales, rulers, blenders, filters, stationery, digital cameras, papaya leaf flour, tapioca flour, commercial fish food and water, Cr₂O₃.

2.3 Research design

This research used a Completely Randomized Design (CRD) method with 4 treatments and each treatment was replicated 5 times. Milkfish fry was reared based on the guidelines of the Institutional Animal Care and Use Committee (IACUC, 2018) and have ethical approval B/KEH/034SN/XII/2022 from the animal ethic committee of Marine and Fiseheries Faculty, Universitas Syiah Kuala. Determining the dose of papaya leaf flour used in this study refers to the treatment used by [8]:

Treatment A: feed without adding papaya leaf powder (control)

Treatment B: adding papaya leaf powder 2% of feed

Treatment C: adding papaya leaf powder 2.5% of feed

Treatment D: adding papaya leaf powder 3% of feed

2.4 Research procedure

2.4.1 Preparation of water and cultivation containers

The containers used in this research were 20 plastic buckets with a volume of 20 liters. Before use, the container to be used is cleaned and dried. Each container is labeled according to the treatment and repetition. The sea water used in this research was sourced from Alue Naga Beach, Banda Aceh. The water is first settled for 2 days, then diluted until the salinity is 14-15 ppt. Then, each container is filled with ± 10 liters of water and given aeration.

2.4.2 Preparation and maintenance of milkfish fry

The milkfish fries used in this research were healthy, not sick or deformed, had no wounds, had active movement, and had a proportional body shape. The milkfish fry used measure 3-5 cm with a weight of $\pm 1-3$ grams and are stocked at 1 fish/1 liter. So, the stocking density for each container is 10 fishes/10 liters. Fish acclimatization is carried out by adapting the fish from their place of origin to a new place for 15-20 minutes and then placing them in a container. The fish adaptation process was carried out for 3 days, until the fish consumed normal food by giving pellets (without treatment) 3 times a day, in the absence of death it was considered that the fish had adapted and were ready to be tested.

2.4.3 Preparation of papaya leaf flour and feeding

The way to make papaya leaf powder is to choose young papaya leaves that are not too old. Then the papaya leaves that have been collected are cleaned with a cloth. After dry, papaya leaves should be cut to ± 3 cm. Then air-dry the papaya leaves until dry and grind them using a blender to get papaya leaf flour, sift the flour using a tight sieve to get maximum and smooth results. Next, the addition of tapioca flour at 5% per kg of feed is used to glue the feed and papaya leaf flour. In addition, 0.5% chromium per kg of feed is added as an indicator of feed digestibility in fecal tests.

The feed used in this research is commercial feed with a protein content of 25-30% to which papaya leaf flour is added. Feed is given ad libitum by spreading it into the rearing media and treating it. During rearing, milkfish fry are fed with a feeding frequency of 3 times a day, namely at 08.00, 12.00 and 16.00 WIB, with a dose of 5% of the fish biomass.

2.4.4 Parameter of reserach

The parameters observed in this research: Specific Growth Rate (SGR), absolute length, absolute weight, Feed Conversion Ratio (FCR), feed digestibility, and Survival Rate (SR) and the quality of the water in the cultivation area.

3 Result and discussion

The results of the Analysis of Variance in this study showed that the addition of papaya leaves to milkfish fry feed had a significant effect ($P < 0.05$) on specific growth rate, absolute length and weight, feed conversion ratio (FCR) value and digestibility, but had no significant effect ($P > 0.05$) on the survival value (SR) of milkfish seeds as shown in Table 1.

Table 1. The effect all of treatment on Specific Growth Rate (SGR), absolute length, absolute weight, Feed Conversion Ratio (FCR), feed digestibility, and Survival Rate (SR)

Treatment	Specific Growth Rate (%/day)	Absolute Length (cm)	Absolute Weight (g)	Feed Conversion Ratio (%)	Digestibility (%)	Survival Rate (%)
A (0%)	0.49 ± 0.07 ^a	0.78 ± 0.16 ^a	0.19 ± 0.03 ^a	3.18 ± 0.48 ^a	65.8 ± 0.33 ^a	90.0 ± 7.07 ^a
B (2%)	0.66 ± 0.11 ^b	0.94 ± 0.16 ^{ab}	0.26 ± 0.04 ^b	2.46 ± 0.60 ^{ab}	72.7 ± 0.34 ^b	88.0 ± 4.47 ^a
C (2.5%)	0.77 ± 0.03 ^c	1.01 ± 0.15 ^{ab}	0.31 ± 0.01 ^c	2.10 ± 0.06 ^b	75.3 ± 1.30 ^c	86.0 ± 11.40 ^a
D (3%)	0.93 ± 0.03 ^d	1.12 ± 0.18 ^b	0.37 ± 0.01 ^d	1.86 ± 0.10 ^c	77.7 ± 0.16 ^d	86.0 ± 7.86 ^a

The values with different superscript letters in a column are significantly different ($p < 0.05$)

The results showed that the specific growth rate values of milkfish seeds were significantly different between treatments. The addition of papaya leaf flour to feed at a dose of 3% or the highest dose in this study is thought to further speed up the food digestion process in the bodies of milkfish fry. This is in accordance with the opinion of [6] and [7] stated that the presence of the papain enzyme in papaya leaves can help fish digest food, because the more papain enzyme added to the feed will cause more protein hydrolysis into amino acids, thereby increasing the growth rate and feed digestibility of fish.

Based on the research results, it was found that the absolute growth values for length and weight of milkfish fry were significantly different between those given the highest dose of papaya leaf powder (treatment D) and those without papaya leaf powder (treatment A/Control). This shows that the dose in treatment D is thought to be more effective in increasing the growth in length and weight of seeds compared to feed that does not contain added papaya leaf powder. This is in accordance with the opinion of [8], the use of papaya leaves in feed is good for increasing the efficiency of protein utilization and feed conversion in fish to increase the growth rate of fish. [9] stated that the papain enzyme contained in papaya leaf powder can form and speed up the digestive process of fish so that the nutrients in the feed can be sufficiently available and more easily absorbed so that it can increase the weight and length of the fish.

In this study, it was seen that the higher the percentage of papaya leaf powder given to the feed, the lower the FCR value. This can also show that the presence of papaya leaf flour in research can affect feed quality. [10] stated that the smaller the FCR value means the higher the quality of the feed, this shows that the amount of feed consumed is greater than the amount of feed remaining. The FCR value is still considered efficient if it is less than 3. [11] explained that the addition of papain to fish feed can increase the amino acid content in the feed so that the nutritional content in the feed can be utilized optimally by fish to meet physiological and growth needs.

The research results showed that the addition of papaya leaf powder to treatment D could increase the percentage of the best total digestibility value, namely 77.7%, this value according to [12] is still within the normal protein digestibility range of milkfish seeds, namely 77.2-78.2%. This statement is reinforced in the [13], that protein digestibility by fish is generally 75-95%. The high digestibility value of milkfish seed feed is thought to be because papaya leaf powder contains the enzyme papain which can help the digestibility of the feed given. This is in accordance with the opinion of [14], the papain enzyme content is able to hydrolyze the protein contained in feed, so that the feed given to fish can be optimally beneficial and affect the efficiency value of feed utilization.

The results of the ANOVA test analysis in this study showed that administration of papaya leaf powder at different doses had no significant effect ($P>0.05$) on the survival percentage (SR) of milkfish fry. The survival rate of milkfish fry at the time of the study ranged from 86-90%. The survival value is in accordance with [15], namely the survival value of milkfish seeds measuring 3-4 cm is 85%. The survival rate of milkfish seeds during the research was still relatively good, ranging between 86-90%. According to [16], there are 3 levels of fish survival, namely survival of $\geq 50\%$ is classified as good, survival of 30-50% is moderate and less than 30% is not good.

4 Conclusions

The addition of papaya leaf powder had a significant effect ($P<0.05$) on increasing the specific growth rate, growth in absolute length and absolute weight, FCR and digestibility of milkfish fry, but had no significant effect ($P>0.05$) on survival rate (SR). Treatment D or the addition of 3%/kg papaya leaf powder to the feed is the best treatment in this study. It showed the values of specific growth rate, absolute length growth and absolute weight, FCR and digestibility respectively were 0.93%, 1.12 cm, 0.37 g, 1, 86% and 77.7%.

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