Fisheries Journal, 15 (3), 1115-1122 (2025)
http://doi.org/10.29303/jp.v15i3.1477

INCREASING FEED EFFICIENCY AND SPECIFIC GROWTH OF AFRICAN CATFISH (*Clarias gariepinus*) WITH PAPAYA LEAF EXTRACT SUPPLEMENTATION

Peningkatan Efisiensi Pakan dan Pertumbuhan Spesifik Ikan Lele Dumbo (*Clarias gariepinus*) dengan Suplementasi Ekstrak Daun Pepaya

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(Received March 18th 2025; Accepted May 20th 2025)

ABSTRACT

Papaya leaf extract is known to have various benefits, including the papain enzyme which can function as a protein digester and improve the fish's immune system. The use of natural ingredients such as papaya leaf extract can also reduce dependence on synthetic chemicals, making it safer for human health and the environment. Based on the explanation above, it is necessary to conduct research on the effect of giving different doses of papaya leaf extract on the specific growth rate, feed conversion ratio and also the water quality of African catfish (Clarias gariepinus) seeds. This research was conducted in June - August 2024 at the Fisheries Production Laboratory of the Matauli Fisheries and Marine College. The effect of adding papaya leaf extract to feed with different doses on the specific growth rate, feed conversion ratio and water quality of African catfish (Clarias gariepinus) seeds produced the best results. The best treatment for Specific Growth Rate was in the P1 treatment of 1.405%, Feed Conversion Ratio of 1.411, and water quality in the form of temperature and pH which were in optimal conditions. This dose can be an alternative as a natural ingredient that has benefits to support an environmentally friendly and sustainable catfish (Clarias gariepinus) seed cultivation system.

Keywords: Catfish, Feed Conversion Ratio, Papaya Leaf Extract, Specific Growth Rate

ABSTRAK

Ekstrak daun pepaya diketahui memiliki berbagai manfaat, di antaranya enzim *papain* yang dapat berfungsi sebagai pencerna protein dan meningkatkan sistem imun ikan. Penggunaan bahan alami seperti ekstrak daun pepaya juga dapat mengurangi ketergantungan terhadap

bahan kimia sintetis, sehingga lebih aman bagi kesehatan manusia dan lingkungan. Berdasarkan penjelasan di atas, maka perlu dilakukan penelitian tentang pengaruh pemberian dosis ekstrak daun pepaya yang berbeda terhadap laju pertumbuhan spesifik, rasio konversi pakan dan juga kualitas air benih ikan lele dumbo (*Clarias gariepinus*). Penelitian ini dilaksanakan pada bulan Juni – Agustus 2024 di Laboratorium Produksi Perikanan Sekolah Tinggi Perikanan dan Kelautan Matauli. Pengaruh penambahan ekstrak daun pepaya pada pakan dengan dosis berbeda terhadap laju pertumbuhan spesifik, rasio konversi pakan dan kualitas air benih ikan Lele dumbo (*Clarias gariepinus*) menghasilkan hasil terbaik. Adapun perlakuan terbaik untuk Laju Perumbuhan Spesifik yaitu pada perlakuan P1 sebesar 1.405 %, Ratio Konversi Pakan sebesar 1.411, dan kualitas air berupa suhu dan pH yang dalam keadan optimal. Dosis tersebut dapat menjadi alternatifsebgai bahan alami yang memiliki manfaat untuk mendukung sistem budidaya benih ikan lele (*Clarias gariepinus*) yang ramah lingkungan dan berkelanjutan.

Kata Kunci: Ikan Lele, Rasio Konversi Pakan, Ekstrak Daun Pepaya, Laju Pertumbuhan Spesifik

INTRODUCTION

Catfish is one of the freshwater fish that has high economic value, delicious meat taste and contains good nutrition, so it is in great demand and is popular with the community (Pamungkas et al., 2024). Catfish cultivation can be done anywhere as long as it still meets the criteria for the cultivation container used. This is in accordance with the statement of Setyaningsih (2020) that catfish can be cultivated in various types of ponds including tarpaulin, concrete, soil, biofloc, and bucket ponds.

Catfish is also a fish whose market demand is quite good and continues to increase, both nationally and internationally. According to Soares (2011), the demand for catfish has increased from year to year. Catfish production from 2010-2014 increased by an average of 35% per year, namely in 2010 it was 270,600 tons to 900,000 tons in 2014 (Rica, 2015). Currently, the marketing prospects for catfish are quite developed and promising, where this situation makes catfish farmers enthusiastic to increase their production. On the other hand, the government is promoting fisheries industrialization through the Ministry of Marine Affairs and Fisheries, which is clearly a challenge and opportunity in the fisheries sector, especially in order to increase catfish production (Wibowo, 2016).

To increase catfish production, especially for catfish seeds, innovation is needed in increasing growth performance in the form of specific growth rates and feed conversion ratios so that they can optimize the growth performance of specific growth rates. One of the innovations used is the addition of supplementation in the form of papaya leaf extract to catfish seed feed.

Papaya leaf extract has been known to have many benefits because it contains good compounds, namely the papain enzyme (Dini et al., 2023). In addition to the papain enzyme, papaya leaf extract also contains flavonoid compounds (phenols), alkaloids, saponins, organic acids, pyrethrum, essential oils, glucosinolates, piperamides, isothiocyanates, capsilin and many others (Wardani & Yudaputra, 2015). The papain enzyme in papaya leaves functions as a protein digester and also to increase the body's resistance of fish. Giving papaya leaf extract to increase the specific growth rate and feed conversion ratio of catfish fry is done by mixing (Coating) in fish feed.

This study aims to determine the effect of papaya leaf extract on catfish fry feed with a predetermined dose to increase the performance of the specific growth rate and feed conversion ratio of catfish fry.

METHODS

Time and Place

This research was conducted in June - August 2024 for 49 days at the Production Laboratory of the Matauli Fisheries and Marine College.

Tools and Materials

The tools and materials used in this study can be seen in tables 1 and 2.

Table 1. Tools Used

No	Tool Name	Amount	Utility
1	Jar	12	Catfish seed place
2	Filtration	12	Maintains stable water quality and filters dirt in the maintenance media
3	Small scoop	1	To collect larvae and make it easier to count larvae
4	Ruler	1	To measure the water level and also measure the length of catfish seeds
5	Measuring glass	1	Makes it easier to measure water volume
6	Thermometer	1	To measure the temperature in the maintenance media
7	pH Meter	1	To measure the pH of the water
8	Spray bottle	1	To spray papaya leaf extract onto catfish seed feed

Table 2. Materials Used

No	Material Name	Amount	Utility
1	Catfish seeds size 5 cm	180 fish	Research object
2	Water	180 liters	Seedling media
3	Artificial feed (ff-999)	4 kg	Catfish feed
4	Papaya leaf extract	100 g	Treatment for research

Research Methods

This study used a completely randomized design (CRD) method, namely with 4 treatments and 3 replications. The administration of papaya leaf extract doses in each treatment refers to the research of Kasmaruddin et al. (2020).

P0 = Without papaya leaf extract
P1 = Papaya leaf extract with a dose of 20 g
P2 = Papaya leaf extract with a dose of 25 g
P3 = Papaya leaf extract with a dose of 30 g

Preparation of Papaya Leaf Extract

The initial step in preparing papaya leaf extract is to weigh the papaya leaf powder using a digital scale according to the specified dose, namely 20 g, 25 g, and 30 g. After that, add 100 ml of water and stir until homogeneous. After that, the papaya leaf extract that has been dissolved is then put into a bottle (spray), then sprayed onto the feed that will be given to catfish seeds.

Test Feed

The feed used in the study was ff-999 feed, which contained 35% protein.

Preparation of Containers and Media

The container used in the study of catfish seeds was a jar container with a volume of 15 liters, 12 pieces. Before use, the jar was first washed using a chemical in the form of PK (Potassium permanganate) and left for 24 hours. Furthermore, the container was cleaned again using clean water, after which it was thrown away again to remove bacteria that were still attached to the container. After that, the container was filled with water according to what had been determined.

Seed Preparation

The seeds used in this study were African catfish seeds that were 5 cm long. The seeds kept in the research container were 15 fish/l as the object of research. Previously, the test fish had to be adapted and fasted for a day so that the stomach of the catfish seeds was empty with the aim that the feed given had been mixed with papaya leaf extract.

Maintenance of Test Fish

Before the African catfish seeds are spread into the maintenance media and given treatment, the African catfish seeds are first measured for length and weight to determine the initial length and weight. After that, during maintenance, the African catfish seeds are given feed as much as 5% of the total biomass. Feeding of the African catfish seeds is given 3 times a day, namely in the morning at 08.00-09.00 WIB, afternoon at 13.00-14.00 WIB, and evening at 19.00-20.00 WIB.

Water changes during maintenance are carried out once a week, namely during sampling, where the water replaced is 50% of the total water volume. Sampling is carried out once a week, namely by measuring the length and weight of the African catfish seeds. To maximize the maintenance of African catfish seeds, monitoring water quality is very necessary. The water quality that is monitored is Temperature and pH, which is carried out once a day, namely at 06.00-07.00 WIB.

Test Parameters

Specific Growth Rate

To measure the specific growth rate in this study, the Halver formula (1989) is used, the formula is:

$$\text{SGR (\%/day)} = \frac{Ln Wt - Ln Wo}{\Delta t} x\ 100$$

Description:
LPS = Specific growth rate (%/day)
Wt = Final fish weight of maintenance (g)
W0 = Initial maintenance weight (g)
Δt = Length of maintenance (days)

Feed Conversion Ratio

To calculate the feed conversion ratio in this study, the formula used is (Farchan, 2006), namely:

$$\text{FCR} = \frac{\text{The final amount of feed given (kg)}}{\text{Final biomass gain (kg)}}$$

Water Quality

The water quality monitored in this study was temperature and pH, which was done once a day. The tool used to measure temperature was a mercury thermometer and to measure pH values was a pH meter.

Data Analysis

The data analysis used in this study used Analysis of Variance (ANOVA) with a confidence level of 95%. If the statistical test results show a significant difference (P <0.05), then a further test was carried out, namely Newman-Keuls, to determine the difference in treatment.

RESULTS

The results obtained in the study on the effect of giving papaya leaf extract with different doses on the specific growth rate and feed conversion ratio of catfish seeds can be seen in Table 3.

Table 3. Specific Growth Rate and Feed Conversion Ratio

	P0	P1	P2	P3
SGR	0.32 ± 0.18^{a}	1.40 ± 0.22^{c}	1.23 ± 0.12^{c}	0.76 ± 0.17^{b}
FCR	2.29 ± 0.87^{a}	1.41 ± 0.26^{a}	1.61 ± 0.23^{a}	1.92 ± 0.30^{a}

Note: Mean values in the same column followed by the same letter indicate results that are not significantly different (P>0.05), while the same column followed by different letters indicate significantly different results (P<0.05).

The highest average specific growth rate was found in treatment P1 (dose 20 g) of 1.40%/day, followed by treatment P2 (dose 25 g) of 1.09%/day, then in treatment P3 (dose 30 g) of 0.76%/day, and the lowest specific growth rate was found in treatment P0 (no dose) of 0.32%/day. The specific growth rate graph can be seen in Figure 1.

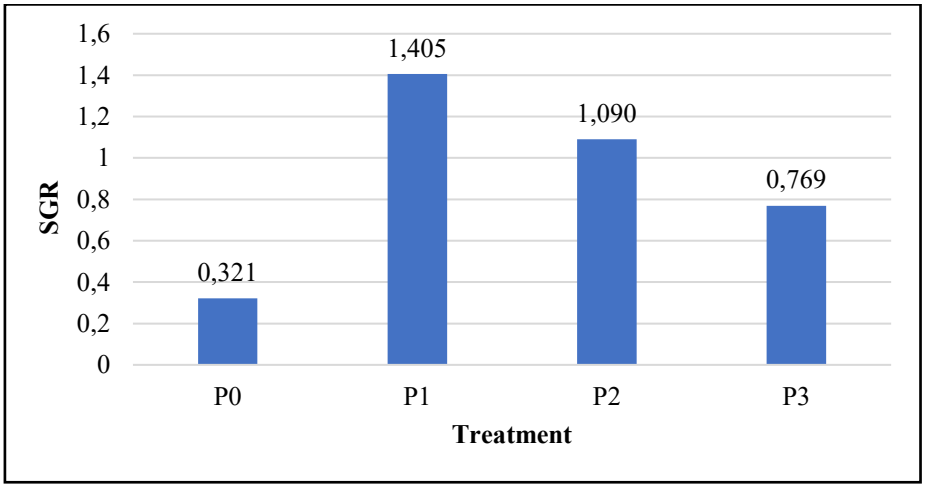

Figure 1. Specific Growth Rate of African Catfish Seeds

The best feed conversion ratio during the study was in treatment P1 of 1.411, followed by treatment P2 of 1.614, followed by treatment P3 of 1.920, and the lowest treatment in treatment P0 of 2.297. The feed conversion ratio graph can be seen in Figure 2.

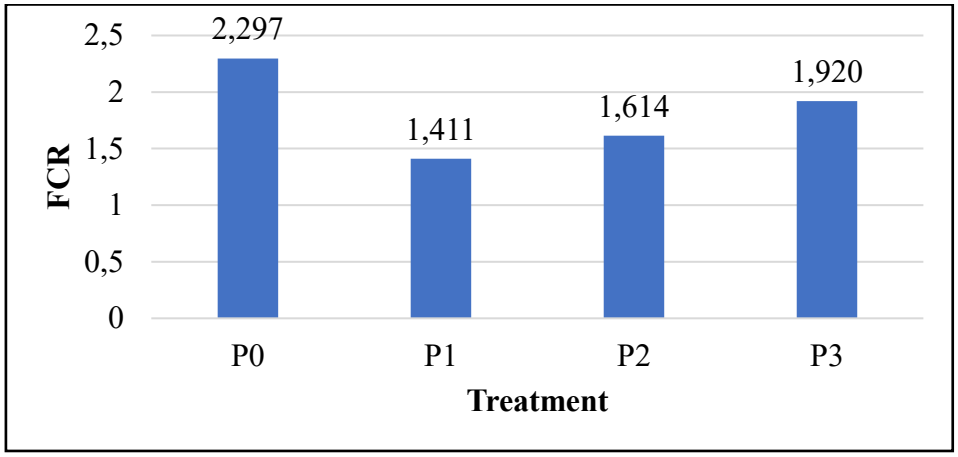

Figure 2. African Catfish Seed Feed Conversion Ratio

The water quality parameters monitored in this study were temperature and pH. The water quality data in the study were an average of 26-27ºC and pH was an average of 6.2-6.8. The water quality data in the study can be seen in Table 4.

Table 4. Water Quality in the Study

Parameter	Average Water Quality in Research		
	Morning	Afternoon	Evening
Temperature (ºC)	26.9 - 27	27.8 - 27.9	26.3 - 26.5
pH	6.3 – 6.4	6.8 - 7	6 - 6.2

DISCUSSION

Specific growth rate (SGR) is a variable used to measure how quickly fish gain weight per unit of time. SGR is calculated for each group at the end of each sampling period. The higher the density of fish, the lower the growth rate per individual. At low densities, fish can utilize feed better than at high densities, because food availability is an external factor that plays a role in growth.

Based on Figure 1, the specific growth rate carried out in the study for 49 days showed that papaya leaf extract given to the African catfish fry feed in treatment 1 showed the highest results. This is because papaya leaf extract contains compounds that can increase the growth of African catfish fry optimally (Piyeto et al., 2022). According to Hasad et al. (2019), the content of papaya leaves consists of minerals, potassium, calcium, potassium, magnesium, copper, iron, zinc and manganese which are compounds needed for fish growth. Papaya leaves contain 35 mg of tocophenol per 100 mg, as well as alkaloid compounds and white sap. This sap contains the enzyme papain, which has proteolytic properties or is able to break down proteins. Meanwhile, old papaya leaves have a higher phenolic compound content (Marhento & Indyawati, 2024).

Based on Figure 2, the feed conversion ratio carried out in the study for 49 days showed that the best FCR was in the P1 treatment, which was 1.411. Papaya leaf extract has an effect on feed quality (Mubaraq et al., 2021). According to Listiowati & Pramono (2014), the smaller the FCR value, the better the quality of the feed, this indicates that the amount of feed consumed is greater than the amount of remaining feed. Water quality in the maintenance media is an important factor in successful cultivation (Mubaraq et al., 2021).

CONCLUSION

The conclusion of this study is that papaya leaf extract has a good effect on the specific growth rate of African catfish seeds and the feed conversion ratio. This occurs because of the presence of papain compounds contained in papaya leaves which can increase the specific growth rate and reduce the feed conversion ratio of African catfish seeds.

ACKNOWLEDGEMENT

I would like to express my gratitude to fellow lecturers at STPK Matauli and students at STPK Matauli who have helped me in the research that I have done.

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