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THE EFFECTIVENESS OF NONI FRUIT EXTRACT *(Morinda citrifolia)* IN FEED ON THE SURVIVAL AND GROWTH OF *Pangasius hypophthalmus* FRY

Efektivitas Ekstrak Buah Mengkudu *(Morinda citrifolia)* Pada Pakan Terhadap Sintasan dan Pertumbuhan Benih Ikan Patin *(Pangasius hypophthalmus)*

Wan Suha Salsabila[1*], Andika Putriningtias[2], Suri Purnama Febri[3]

[1] Aquaculture Study Program, Faculty of Agriculture, Samudra University

Prof. Dr. Sharief Thayeb Street, Meurandeh, District. 24416 Old Langsa, Langsa City

*Corresponding Author: wansuhasalsabila@gmail.com

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ABSTRACT

As a freshwater commodity, catfish *(Pangasius hypophthalmus)* has a high market value, making it worthy of cultivation. The purpose of this study was to determine the optimal dosage of noni fruit extract for the survival and growth of catfish fry, which is then applied to commercial feed. In aquaculture, feed plays a crucial role in determining the success of fish growth. The catfish used were 8-10 cm in size. The method used in this study was a Completely Randomized Design (CRD) with four treatments and three replications. Where P1 (without giving noni extract), P2 (giving noni extract 5 ml/kg feed), P3 (giving noni extract 10 ml/kg feed) and P4 (giving noni extract 15 ml/kg feed. The results of the study showed that the best survival was in P3 (86.66%), the best absolute weight growth was in P3 (4.80g), the best absolute length growth was in P2 (1.04 cm), the best daily growth rate was in P3 (1.64%) and the best feed conversion ratio was in P3 (2.10%).

Keywords: Growth, Noni fruit extract, Pangasius hypophthalmus, Survival

ABSTRAK

Sebagai komoditas air tawar, ikan patin (*Pangasius hypophthalmus*) memiliki nilai jual yang cukup tinggi sehingga layak untuk dikembangkan. Adapun tujuan dari penelitian ini adalah untuk mengetahui dosis optimal ekstrak buah mengkudu untuk sintasan dan pertumbuhan benih ikan patin yang diaplikasikan ke dalam pakan komersial. Dalam usaha budidaya, pakan memegang peranan penting sebagai penentu keberhasilan pertumbuhan ikan. Ikan patin yang digunakan berukuran 8-10 cm. Metode yang digunakan pada penelitian ini yaitu Rancangan Acak Lengkap (RAL) dengan 4 perlakuan dan 3 ulangan. Dimana P1 (tanpa pemberian ekstrak mengkudu), P2 (pemberaian ekstrak mengkudu 5 ml/kg pakan), P3 (pemberian ekstrak mengkudu 10 ml/kg pakan) dan P4 (pemberian ekstrak mengkudu 15 ml/kg pakan. Hasil penelitian menunjukkan sintasan terbaik berada pada P3 (86,66%), pertumbuhan bobot mutlak terbaik berada pada P3 (4,80g), pertumbuhan panjang mutlak terbaik berada pada P2 (1,04 cm),

laju pertumbuhan harian terbaik berada pada P3 (1,64%) dan rasio konversi pakan terbaik berada pada P3 (2,10%).

Kata Kunci: Ekstrak buah mengkudu, Ikan patin, Pertumbuhan, Sintasan

INTRODUCTION

Catfish (Pangasius hypophthalmus) is a freshwater fish commodity with high economic value and great potential for development in aquaculture activities (Ghufran, 2010). Catfish have a smooth, scaleless body, and a slightly elongated and flat body shape. Its body color is grayish or bluish on the back and silvery white on the belly (Mahyuddin, 2010). The advantages of catfish include good adaptability to the environment, its large body size, soft flesh texture, lack of bones, and a savory taste that is widely favored by the community (Rogayah, 2020). However, in cultivation practices, obstacles often encounter in the form of suboptimal growth caused by various factors such as stress due to environmental conditions and poor feed quality. To meet these needs, efficient cultivation strategies are needed, especially at the seeding stage, because this phase is crucial for overall production success. Aquaculture production can be increased by providing quality feed ingredients.

Improving feed quality is necessary to increase aquaculture productivity. One alternative that can be considered is the addition of natural ingredients to the feed, and feed with high nutritional value will help the fish grow well. Feed is a crucial component in aquaculture efforts, as it plays a crucial role in fish growth (Anugrahaeni, 2016). One potential alternative natural ingredient is the noni fruit (Morinda citrifolia), a tropical plant long used as a traditional medicine and functional food (Sari, 2015).

The noni plant contains various bioactive compounds, such as flavonoids and vitamin C, which act as antioxidants and immunostimulants, increasing the fish's resistance to environmental stress and disease (Ilmayati et al., 2018). The addition of noni fruit extract to the feed is expected to have a positive effect on the survival and growth of catfish fry. The bioactive compounds in noni not only strengthen the fish's immune system but also have the potential to increase the efficiency of feed metabolism, enabling faster and optimal growth. Thus, the use of noni fruit extract in commercial feed can be an innovative alternative to improve the performance of catfish cultivation in an environmentally friendly, economical, and sustainable manner.

Previous research by Sylvawan et al. (2014) previously used noni fruit extract in Sangkuriang catfish (Clarias sp.). Furthermore, Sujito (2017) used noni fruit extract in feed, but it did not affect the survival rate of African catfish (Clarias gariepinus) fry. Research on the effect of noni fruit extract on the survival and growth of catfish fry has not been conducted. Therefore, this study aims to analyze the effectiveness of noni fruit extract at different doses on the survival and growth of catfish (Pangasius hypophthalmus) fry and determine the optimal dose that provides the most significant effect. The results of this study are expected to contribute scientifically to the development of herbal-based natural feed technology in freshwater fish cultivation, while also enriching future scientific studies in the fields of aquaculture and fish nutrition.

RESEARCH METHODS

Place and Time

This research was conducted for 40 days from December to February 2025 at the Experimental Pond Seeding Laboratory of the Aquaculture Study Program, Faculty of Agriculture, Samudra University. The preparation of noni fruit extract was carried out at the Chemistry Laboratory of the Faculty of Teacher Training and Education, Syiah Kuala

University, Banda Aceh, to support testing the effect of the extract on the survival and growth of catfish (Pangasius hypophthalmus) fry.

Tools and Materials

This research used various equipment and materials to support the maintenance, measurement, and testing processes. Tools such as jars, aerators, and water meters were used to maintain the condition of the fish during cultivation, while blenders and spray bottles assisted in the preparation and administration of noni extract to the feed. The research materials included catfish fry, noni fruit extract, progol, and commercial feed used to test the effect of noni extract on the survival and growth of catfish fry (Pangasius hypophthalmus).

Experimental Design

This study used an experimental method with a Completely Randomized Design (CRD) with 4 treatments and 3 replications to determine the effect of adding noni extract on the survival and growth of catfish seeds, the four treatments used were:

P1: Without the addition of noni extract/ 1 kg of feed (control)
P2: Addition of noni extract at a dose of (5ml/kg feed)
P3: Addition of noni extract at a dose of (10ml/kg feed)
P4: Addition of noni extract at a dose of (15ml/kg feed)

Research Procedure

1. **Making Noni Extract**
   The process of making noni extract involves several stages: peeling, washing, drying, and grinding the dried noni fruit. During the extraction stage, the noni powder is placed in a glass vessel and then extracted using a maceration technique using 70% ethanol as a solvent. The maceration is carried out for 24 hours with three stirrings over three days. The resulting macerate is then evaporated using a rotary evaporator to obtain an ethanol filtrate (Sogandi et al., 2019).
2. **Container Preparation**
   The maintenance containers are 12 25-liter jars. Before use, the jars are cleaned and filled with 10 liters of water each. They are then aerated to increase oxygen levels in the water.
3. **How to Mix Noni Extract in Feed**
   The feed coating process involves mixing noni extract into commercial feed according to the specified dosage. Progol is used as an adhesive, while the noni extract is dissolved in 100 ml of distilled water and sprayed evenly onto the feed, stirring thoroughly. Afterward, the feed is dried or air-dried until ready to use.
4. **Preparation and Maintenance of Patin Fish Seed**
   This study used 120 8–10 cm catfish fry, stocked at a density of 10 per tank. Prior to rearing, the fry were acclimatized for 5 minutes and then acclimatized for one week to allow them to adjust to their new environment. The rearing process lasted for 40 days, with feeding based on the ad satiation method three times daily (morning, afternoon, and evening). Water quality was maintained through 50% water changes every week and siphoning every three days to prevent waste buildup and maintain fish health.
5. **Observation Parameters**
   Observation parameters in this study included survival, absolute weight growth, absolute length growth, daily growth rate, and feed conversion ratio. Weight and length measurements were conducted every 10 days, while water quality measurements, including temperature, pH, and DO, were conducted at the beginning, middle, and end of the study.

Data Analysis

Research data, including survival, absolute weight gain, absolute length gain, daily growth rate, and feed conversion ratio, were analyzed using analysis of variance (ANOVA) to determine the effects of the treatments. If the results showed significant differences, a Duncan's test was conducted to determine which treatments were significantly different and which were not, by comparing the averages between treatments grouped by letter. Meanwhile, water quality parameters were analyzed descriptively to provide a general overview of the environmental conditions of the rearing environment during the study.

Calculated Variables

Survival Rate (SR)

To calculate the survival rate of fish during research, you can use the formula determined by (Effendi, 2002), namely:

$$\mathbf{SR=\frac{Nt}{No}x100}$$

Description:
SR = Fish seed survival (%)
Nt = Number of fish alive at the end of the study (tail)
No = The number of fish released at the start of the study (tail)

Absolute Weight Gain

Absolute weight growth is calculated using the formula (Effendie, 2002), namely:

$$\mathbf{PBM= Wt - Wo}$$

Description:
PBM = Absolute weight gain (g)
Wt = Weight of test fish at the end of the study (g)
Wo = Weight of test fish at the start of the study (g)

Absolute Length Growth

Absolute length growth is calculated using the formula (Effendie, 2002), namely:

$$\mathbf{PPM= Pt - Po}$$

Description:
PPM = Absolute Length Growth (cm)
Pt = Length of the test fish at the end (cm)
Po = Length of test fish at the beginning (cm)

Daily Growth Rate

The daily growth rate can be calculated using the formula according to (Zonneveld et al., 1991), namely:

$$\mathbf{LPH=\frac{Lnwt-Lnwo}{T}\ X\ 100\%}$$

Description:
LPH = Daily growth rate (%/day)
Wt = Average weight of fish on day t (g)
Wo = Average weight of fish on day 0 (g)
T = Maintenance time (days)

Feed Conversion Ratio (FCR)

The feed conversion ratio can be calculated using the Tacon (1987) formula, namely:

$$\mathbf{RKP=\frac{F}{Wt+D-Wo}}$$

Description:
FCR = Feed conversion ratio

F = Spent feed (g)
Wt = Fish biomass at the end of the study (g)
Wo = Fish biomass at the beginning of the study (g)
D = Number of dead fish (tails)

RESULT

1. Survival Rate

The results of the ANOVA analysis showed that the addition of noni extract to feed at different doses had no significant effect (P>0.05) on the survival rate of catfish (Pangasius hypophthalmus) fry (Figure 1). The highest survival rate of catfish was found in treatment P3 at 86.66%, while the lowest value was found in treatments P1 and P2 at 76.66%.

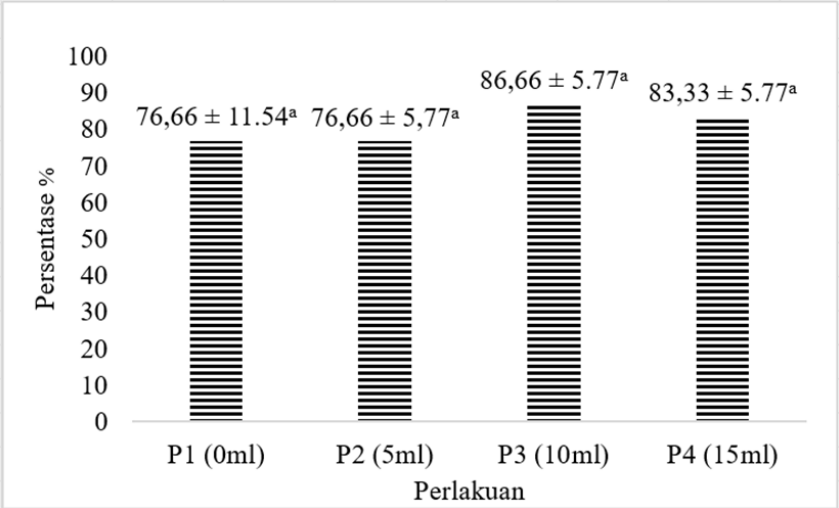

Figure 1. Percentage of Patin Fish Seed Survival

2. Growth Performance

The results of the ANOVA test showed that the addition of noni fruit extract to the feed at different doses significantly affected the absolute weight growth of the fish (P<0.05), but the absolute length growth and daily growth rate did not significantly affect the growth performance of the catfish fry during the study. The growth performance of the catfish fry during the study is presented in Table 1.

Table 1. Growth Performance of Catfish Fry

Treatment	Growth Parameters		
	Absolute Weight (g)	Absolute Length (cm)	Daily growth rate (%/hari)
P1 (0 ml)	4.00 ±0.22^{a}	1,02 ±0,16^{a}	1,51 ±0.13^{a}
P2 (5 ml)	4.60 ±0.13^{bc}	1,04 ±0,15^{a}	1,61 ±0.05^{a}
P3 (10 ml)	4.80 ±0.18^{c}	1,02 ±0,10^{a}	1,64 ±0,07^{a}
P4 (15 ml)	4.43 ±0.20^{b}	0,91 ±0,11^{a}	1,54 ±0.07^{a}

Note: Different letters on the same line indicate significantly different treatment effects (P<0.05). The data listed are standard deviation data.

3. Feed Conversion Ratio

ANOVA results showed that the addition of noni extract to feed at different doses had a significant effect (p<0.05). The feed conversion ratios for the catfish fry study are presented in Table 2.

Table 2. Feed Conversion Ratio for Catfish Fry

Treatment	FCR
P1 (0ml)	2.56 ±0.12[b]
P2 (5ml)	2.12 ±0.17[a]
P3 (10ml)	2.10 ±0.04[a]
P4 (15ml)	2.26 ±0.09[a]

Note: Different letters on the same line indicate significantly different treatment effects (P<0.05). The data listed are standard deviation data.

4. Water Quality

The data obtained were obtained from water quality measurements during the study. Parameters observed included acidity (pH), dissolved oxygen (DO), and temperature.

Table 3. Water Quality of Pangasius Fish Fry

Treatment	pH	DO (mg/L)	Temperature (ºC)
P1	6,4 – 6,8	5,1 – 7,3	26 – 28,3
P2	6,4 – 6,9	5,2 – 7,6	26,1 – 28,1
P3	6,1 – 7,2	6 – 7,6	26 – 28,1
P4	6,3 – 7,2	5,1 – 7,6	26 – 28,3

DISCUSSION

Survival Rate

Survival during cultivation is influenced by the addition of noni fruit extract to feed as a natural antioxidant compound. The antioxidants contained in noni fruit extract function to boost the body's immune system. The flavonoid and vitamin C content in noni fruit can act as immunostimulants, aiming to boost the fish's immunity (Ilmayati et al., 2018). Furthermore, the antioxidant compounds contained in noni fruit extract can prevent cell damage (Sayuti and Yenrina, 2015), enabling catfish to grow and survive.

Growth Performance

The results showed that the addition of noni fruit extract (Morinda citrifolia L.) to feed affected the absolute weight growth of catfish fry, but had no significant effect on absolute length growth and daily growth rate. The best treatment was P3 (10 ml/kg feed), with the highest absolute weight value of 4.80 g, while the treatment without extract, P1 (Control), produced the lowest value of 4.00 g. The increase in absolute weight at a dose of 10 ml/kg feed was due to the arginine content in noni fruit, which forms protein and meets the fish's protein needs (Mahtuti & Ibaadillah, 2018). This protein also aids growth, repairs damaged cells, and increases fish biomass (Winaldi, 2017). Furthermore, noni fruit contains secondary metabolites that are highly beneficial for fish growth and health.

However, at a high dose of P4 (15 ml/kg feed), absolute weight growth decreased. This occurs because high doses can cause side effects, one of which is an excessively bitter taste in the feed, making it difficult for the fish to digest properly. This is consistent with the opinion of Jayamarwan et al. (2008), who stated that saponins have a bitter taste. The negative effects of saponins include reduced feed consumption due to their taste, which can reduce intestinal motility, decrease protein digestibility, and cause membrane damage, as well as inhibit nutrient processing (Marlinda, 2012). The results of this study align with those of Milliati et al. (2025),

who stated that administering noni fruit extract at high doses showed low absolute weight growth.

The highest absolute length growth was achieved in P2 (5 ml/kg feed) with a value of 1.04 cm, but there was no statistically significant difference between treatments. This suggests that noni extract does not support length growth because the fish use energy to increase tissue (muscle) rather than lengthen the body frame. Benedictus (2013) stated that the energy source obtained from feeding is utilized primarily for maintenance energy needs, with the remaining energy in the fish being used for growth. Noni fruit contains arginine, which helps form protein and meet fish protein requirements (Mahtuti & Ibaadillah, 2018). This protein also aids growth and increases biomass (Winaldi, 2017).

The highest daily growth rate was also obtained in P3 (10 ml/kg feed) at 1.64%, but there was no significant difference between treatments. This indicates that the stability of daily growth can be influenced by environmental and physiological factors. Research (Sumpeno 2013, cited in Berek et al. 2010) explains that daily fish growth is influenced by two factors: internal factors, including genetic traits and physiological conditions, and external factors related to feed and the environment. Surwirya et al. (2008) explain that vitamin C is needed by fish to increase metabolism and resistance to environmental changes and disease. The P3 treatment (10 ml) showed a high daily growth rate of 1.64%. The high daily growth rate in this treatment indicates that the fish are able to optimally utilize their feed, resulting in good growth. According to (Mahtuti & Ibaadillah, 2018), noni fruit contains arginine, which plays a role in protein formation, so this protein can help fish growth and increase biomass. Furthermore, noni fruit contains secondary metabolites that are very beneficial for fish growth and health.

Feed Conversion Ratio

The research results show that P3 was the best treatment among the other treatments. This indicates that this treatment is the optimal dose for using noni extract in the feed given and can be utilized and digested well by catfish. According to Iilmayati et al., (2018), noni fruit has a diverse nutritional content in noni fruit, also containing moridone and anthraquinone compounds that can increase appetite (Sinaga et al., 2022). A low feed conversion ratio value in the feed indicates that the feed given is almost completely utilized. Therefore, the lower the feed conversion ratio value, the more efficiently the feed given is used for growth and vice versa. The higher the feed conversion value, the less efficiently the feed given is used for growth (Saltin et al., 2016). Based on the results of this study, P1 without the administration of noni fruit extract in the feed produced a high feed conversion ratio value of 2.56, while P3 with a dose of 5 ml of noni fruit extract in the feed had a low feed conversion ratio value.

Water Quality

Based on the results of water quality measurements during the study, the pH, DO, and temperature values were within the optimal range to support the growth and survival of catfish fry. The pH value ranged from 6.1–7.2, which is still within natural limits and is suitable for catfish cultivation activities according to the ideal range of 6–8.5 (Eliyani, 2020). The DO value of 5.1–7.6 mg/L was also within the range that supports the life of catfish, as stated by Khotimah et al. (2016) that the optimal DO for catfish cultivation is 2.0–7.0 mg/L. The water temperature during the study ranged from 26–28.3°C, which is included in the optimal range for catfish growth according to Wangni et al., (2019), which is 25.4–32.3°C. Thus, the water quality conditions during the study were classified as good and supported the process of maintaining catfish fry.

CONCLUSION

Based on the research results, the administration of noni fruit extract to the feed of catfish (Pangasius hypophthalmus) fry has an effect on the growth and survival of the fish. Treatment with a dose of 10 ml/kg feed (P3) showed the best results in survival (86.66%), absolute weight growth (4.80 g), daily growth rate (1.64%), and feed conversion ratio (2.10%). The analysis results showed that the administration of noni fruit extract had a significant effect ($P<0.05$) on absolute weight growth and feed conversion ratio, but had no significant effect ($P>0.05$) on survival, absolute length growth, and daily growth rate. Thus, the dose of noni fruit extract of 10 ml/kg feed is the most optimal dose to increase the growth of catfish fry.

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