



Growth and survival of catfish (*Clarias gariepinus*) with addition of papain enzymes in feed at Karang Dapo Village, Pagaram, South Sumatera

Pertumbuhan dan kelangsungan hidup ikan lele sangkuriang (*Clarias gariepinus*) dengan penambahan enzim pepaya pada pakan di Desa Karang Dapo, Pagaram, Sumatera Selatan

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Abstract

Catfish (*Clarias gariepinus*) is a freshwater fish that is widely cultivated in Indonesia. Production cost of fish farming activities spend 60-70% on the use of feed. Therefore, feeding must be effective and efficient so that catfish can make good use of it for its growth. The addition of an exogenous enzyme in the form of papain enzyme can increase the efficiency of feed utilization. The purpose of this study was to determine the effect of the addition of the enzyme papain in feed on the growth and survival of sangkuriang catfish (*Clarias gariepinus*). The treatments consisted of P0: control (without the addition of the papain enzyme) and P1: treatment with the addition of the papain enzyme with a dose of 1.5 mg kg⁻¹ of feed. The parameters observed were absolute weight growth, absolute length growth, feed efficiency, survival, and water quality. The results showed that the addition of the enzyme papain to the feed produced the highest of absolute weight growth 19.97 g, absolute length growth 7.74 cm, feed efficiency 90.25%, survival rate 90%, and water quality such as temperature from 24.3 - 28.3 °C and pH 7.2 - 7.4.

Keywords: Catfish; Feed; Papain enzyme

Abstrak

Ikan lele (*Clarias gariepinus*) merupakan jenis ikan air tawar yang banyak dibudidayakan di Indonesia. Biaya produksi dari kegiatan budidaya ikan menghabiskan 60-70% untuk penggunaan pakan. Oleh karena itu pemberian pakan harus efektif dan efisien agar ikan lele dapat mememanfaatkannya dengan baik untuk pertumbuhannya. Penambahan enzim eksogen berupa enzim papain dapat meningkatkan efisiensi pemanfaatan pakan. Tujuan dari penelitian ini adalah untuk mengetahui pengaruh penambahan enzim papain dalam pakan terhadap pertumbuhan dan kelangsungan hidup ikan lele sangkuriang (*Clarias gariepinus*). Perlakuan terdiri dari P0: kontrol (tanpa penambahan enzim papain) dan P1: perlakuan dengan penambahan enzim papain dengan dosis 1,5 mg kg⁻¹ pakan. Parameter yang diamati adalah pertumbuhan bobot mutlak, pertumbuhan panjang mutlak, efisiensi pakan, kelangsungan hidup, dan kualitas air. Hasil penelitian menunjukkan bahwa penambahan enzim papain pada pakan menghasilkan pertumbuhan bobot mutlak tertinggi 19,97 g, pertumbuhan panjang mutlak 7,74 cm, efisiensi pakan 90,25%, kelangsungan hidup 90%, dan kualitas air yaitu suhu 24,3 - 28,3 °C. dan pH 7,2 - 7,4.

Kata Kunci: Enzim papain; Ikan lele; Pakan

1. Introduction

Catfish (*Clarias gariepinus*) is a freshwater fish that is widely cultivated in Indonesia. Catfish is widely consumed because it is liked by various groups of people, has a high protein content, and is easy to process. Besides, this catfish also has a relatively fast growth time compared to other fish when it is cultivated (Sitompul *et al.*, 2012). The high consumer demand makes catfish farmers do intensive business. In 2015-2018 the national catfish production reached 841.75 thousand tons and an increase of 1.81 million tons in 2018 (KKP, 2018). So that catfish farming requires an additional area and costs for feed that is not small. Catfish is a fish that is quite popular and cultivated. As for the problems faced in catfish farming in the form of disease-

stricken fish and feed at a significant cost, the efficiency of the feed used is also not very effective in accelerating fish growth.

Artificial feed is feed made from several ingredients which are then processed into a special form as desired, feed is one of the factors in the success of cultivation (Mudjiman, 2004). The production costs of aquaculture spend 60-70% in the use of commercial feed provided (Ringo *et al.*, 2010). Therefore, feeding must be effective and efficient so that catfish can make good use of it for its growth. The addition of exogenous enzymes can increase the efficiency of feed utilization. One of the exogenous enzymes that can be used is the papain enzyme.

Papain is an enzyme derived from papaya extract that has proteolytic properties and can hydrolyze protein into amino acids. Papain added to feed can increase the ability to break protein into amino acids so that which causes protein absorption to increase (Amri and Mamboya, 2012). Papain enzyme also helps in the process of digestion of feed, where the energy in the

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feed can repair body tissues. The efficiency of feed utilization in catfish in the absorption of nutrients is higher than hydrolyzed feed (Singh *et al.*, 2011). The purpose of this study was to determine the effect of the use of the enzyme papain in feed on the growth and survival of catfish (*Clarias gariepinus*).

2. Materials and Methods

2.1. Tools and Materials

The tools used in the study include a ground pool, net cage a size of 1 m x 1 m x 1 m, ruler, digital scales, pH meter, thermometer, and a spray bottle. While the materials used include catfish measuring 5-7 cm, commercial feed with a protein content of 30%, and the enzyme papain.

2.2. Procedure

2.2.1. Preparation of Containers

The container used in catfish rearing is a waring which functions as a fish-raising container. Waring is placed in the ground with a water level of 80-100 cm. Before using the waring, wash it with running water.

2.2.2. Feed Production Test

The test feed used was in the form of artificial feed in the form of pellets added with the papain enzyme as much as 1.5 mg/kg. The feed is mixed with the commercial papain enzyme in the form of a powder. Before being mixed, 1.5 mg of papain enzyme is first dissolved in 100 ml water until it is homogeneous, then the enzyme solution is mixed into the 1 kg commercial feed using a sprayer (spray bottle). Then dry the feed for 15 minutes. Enzyme blending is done each time before feeding.

2.2.3. Maintenance of Catfish

The stocking was carried out as much as 50 fish m⁻³. Before the fish were stocked, acclimatization was carried out, then the fish were adapted using commercial feed for seven days before field practice began, and then the fish have fasted for 24 hours. Feeding fish is carried out by *at satiation* and 3 times a day, at 07.00 a.m, 12.00 a.m, and 5.00 p.m. Weighing initial weight and length/initial sampling is carried out after adaptation. Fish maintenance is carried out for 30 days. During maintenance, water quality measurements are taken in the form of temperature and pH every morning.

2.3. Design

This research is an experimental study with two treatments, namely the addition of phytase enzymes. The treatments in this study are:

P0 : control (without the addition of papain enzyme)

P1 : the addition of papain enzyme at a dose of 1.5 mg.kg⁻¹

2.4. Parameters

2.4.1. Absolute Weight Growth

Fish weight growth during rearing is calculated using the following formula:

$$W = W_t - W_0$$

Information:

W = growth in absolute weight of fish (g)

W_t = fish weight at the end of maintenance (g)

W₀ = fish weight at the beginning of maintenance (g)

2.4.2. Absolute Length Growth

Fish length growth during rearing is calculated using the following formula:

$$L = L_t - L_0$$

Information:

L = absolute length growth of fish (cm)

L_t = length of fish at the end of maintenance (cm)

L₀ = length of fish at the beginning of rearing (cm)

2.4.3. Specific Growth Rate

The calculation of the specific growth rate (SGR) is:

$$SGR = (\ln W_t - \ln W_0) / t \times 100$$

Information:

SGR = daily specific growth (% per day)

W₀ = average weight of catfish at the beginning of rearing (g)

W_t = average weight of catfish at the end of maintenance (g)

T = length of maintenance time (days)

2.4.4. Feed Efficiency

Feed efficiency (EP) is calculated using the formula:

$$EP = ((W_t + W_d) - W_0) / F \times 100$$

Information:

EP = feed efficiency (%)

W_t = final fish biomass (g)

W₀ = initial fish biomass (g)

W_d = dead fish biomass (g)

F = amount of feed given (g)

2.4.5. Survival

Fish survival was calculated using the formula:

$$\text{Survival} = N_t / N_0 \times 100$$

Information:

N_t = number of fish alive at the end of maintenance (fish)

N₀ = number of fish at the beginning of maintenance (fish)

2.5. Data Analyze

Data on growth, specific growth rate, feed efficiency, and survival obtained will then be processed using Microsoft Excel and analyzed descriptively and supported by literature.

3. Result and Discussion

3.1. Growth

Weight growth in P1 treatment showed higher results than that in P0 (Figure 1). The growth in absolute weight of fish P0 was 16.21 g, while in P1 treatment was 19.27 g.

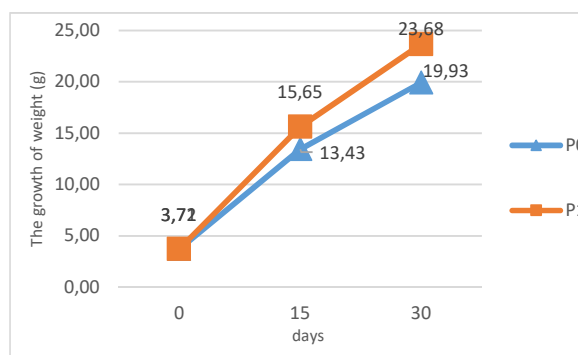


Figure 1. Graph weight growth catfish.

The absolute length growth of fish P0 is 6.88 cm and in P1 treatment is 7.74cm. The length growth of catfish during maintenance is presented in Figure 2.

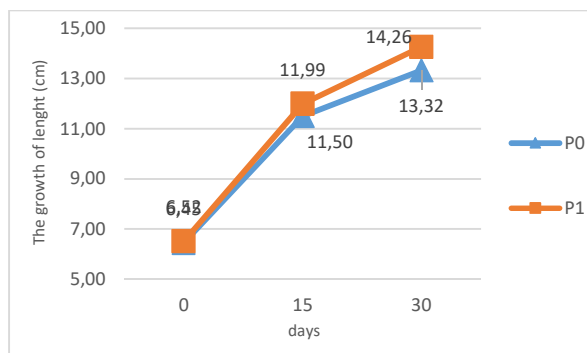


Figure 2. Graph length growth catfish.

Growth is the increase in length and weight of fish at a time. The growth of catfish can occur by the presence of excess energy reserves contained in the feed. The energy contained in the feed that is consumed exceeds the energy needed for fish maintenance to carry out body activities and maintenance of its body, so the fish will be used for their growth (Djauhari *et al.*, 2017). Based on the results obtained, the addition of the enzyme papain in the feed (P1) resulted in higher absolute weight and length growth than the control treatment (P0). The absolute weight growth value of catfish is higher than in the study of Amin *et al.*, (2020) who were fed with local feed ingredients. Fish growth is influenced by various factors, including feed quality, fish genetics, water quality of the rearing media, and application of aquaculture technology (Hartami and Rusydi, 2016).

The feed with the addition of the papain enzyme can produce higher protein digestibility when compared to feed without the addition of the papain enzyme because the addition of the papain enzyme in feed can increase the protein content and protease enzymes derived from feed (Rachmawati *et al.*, 2018).

The addition of the papain enzyme can optimize the digestion process of protein in fish feed. The protein content in feed greatly affects the growth of fish. Feed with optimal protein can produce maximum growth. The papain enzyme contains the active ingredient papain by 2.38%, this causes the more papain is added to the feed, the more protein can be broken down into peptides and amino acids. The more protein that can be hydrolyzed, the more amino acids that can be absorbed by the body to increase fish growth (Amalia and Arini, 2013). Whereas in control feeding, there is no papain enzyme that can help hydrolyze protein in the feed, so that only a small amount of protein can be absorbed by the body.

3.2. Feed Efficiency

The data of catfish feed efficiency during maintenance in Figure 3 shows that the feed efficiency at P1 was 90,25% higher than the P0 treatment which was 87,56%.

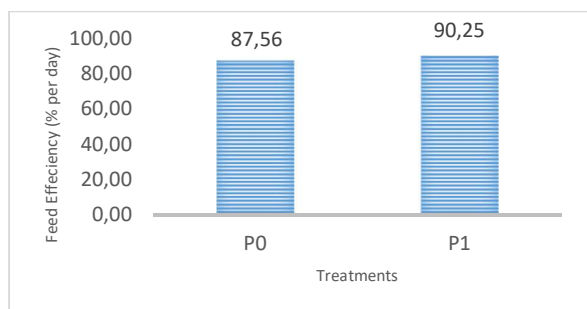


Figure 3. Graph of catfish feed efficiency.

Feed efficiency is the ratio between weight gain and feed consumed expressed in percent. The feed efficiency obtained in treatment P1 was higher than that of P0 without the addition of enzymes in the feed. The higher the feed efficiency value, the better the fish response to the feed, which is indicated by the fast growth of fish (Hariadi *et al.*, 2005). It is suspected that the added papain enzyme can hydrolyze the protein contained in the feed so that the feed given to catfish is used efficiently and can affect the value of utilization efficiency in feed (Amalia and Arini, 2013).

3.3. Survival

The survival rate in P0 fish was 85% and P1 treatment was 87.5%. The survival of catfish is presented in figure 4. Survival is the percentage of the number of cultivated fish that is alive in a certain time. The survival of fish can be influenced by many factors such as fish stocking density, feed provided, environment (water quality), quality of seeds used, pests, and diseases (Kordi, 2015). The survival rate of catfish in treatment P1 resulted in a higher value than treatment P0. This is because the papain enzyme can be used as an immunostimulant, namely, the papain enzyme has proteolytic and antimicrobial activity, as well as carpung alkaloids which function as antibacterial (Ardina, 2007).

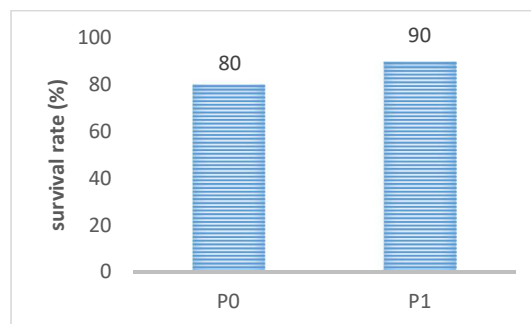


Figure 4. Graph survival of catfish

3.4. Water Quality

Water quality in fish rearing is one of the most important factors in aquaculture. The results of water quality data obtained during the maintenance of catfish are included in good conditions for the growth and survival of catfish. The water temperature in the maintenance ranges from 24.3-28.2 °C, this temperature range is classified as good for catfish growth, this is in line with BSN (2014) that the optimum temperature for catfish is 25-30 °C. The pH value obtained in the catfish rearing process is 7.2-7.4 this value indicates a good pH in the maintenance process. This is in line with (BSN, 2014) which states that a good pH value range for catfish farming is 6.5-8.5.

4. Conclusion

The results showed that the addition of the enzyme papain to the feed produced the highest absolute weight growth 19.97 g, absolute length growth 7.74 cm, feed efficiency 90.25%, survival rate 90%, and water quality values, namely temperature 24.3 - 28.3°C and pH 7.2 - 7.4.

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