

Use of Fermented Cocoa Skin as Raw Material for Carp Feed (*Cyprinus carpio*)

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Abstract

This study aims to analyze the use of fermented cocoa pods in feed to determine the growth rate, and survival of carp (*Cyprinus carpio*). This research was conducted at the Laboratory of the Faculty of Agricultural and Animal Sciences, Universitas Islam Kebangsaan Indonesia using a completely randomized design or (CRD) 4 treatments with 3 replications consisting of P1: control, P2: 35% fermented cocoa husk + 65% commercial pellet feed, P3: 40% fermented cocoa husk + 60% commercial pellet feed, P4: 45% fermented cocoa husk + 55% commercial pellet feed. The results showed that the addition of fermented cocoa pods into pellet feed had a significant effect on growth in length, weight, and feed conversion of carp (*Cyprinus carpio*) and had a significant effect on survival where F count > F table.

Keywords: Goldfish, Fermented Feed, Growth and Survival

1. Introduction

Carp has a very important role as a provider of animal protein which has very good potential to be developed because it is easy to maintain, has a very fast growth rate, the price is affordable by the community and has a fairly high nutritional value, so that it can be utilized to improve community nutrition. According to Statistics West Sumatra (2002), the production of fish from carp has increased by 19.3% per year, while the cultivation business with maintenance in ponds has increased by 1.4% per year and maintenance in cages (in streams and irrigation) has increased. by 33.2% per year. Feed is one of the factors that determine the success of aquaculture business. Goldfish is a fish that is very popular with the people of Indonesia [1]. The demand for carp products is quite large and makes goldfish one of the favorite fish of the Indonesian people. The advantages of carp for farmers include easy maintenance, relatively fast growth, the number of eggs produced is high and eats everything [2]. In addition, the price of goldfish is not too expensive, meaning that it can be affordable by all groups. The price of goldfish in general is Rp. 30.000/kg, this price is the benchmark price from West Lombok Regency [3]. Therefore, it is not surprising that carp is one of the leading commodities in the freshwater fishery sector. In general, commercial feed can spend about 60-70% of the total production cost [4]. The high price of feed and its low nutritional quality are obstacles in the cultivation process. Therefore,

The problem in carp cultivation is the use of commercial feed in large quantities to complement the protein needs of carp growth. This causes production costs in carp cultivation to be high. Generally, commercial feed can absorb 60% of production costs. Therefore, alternative feed sources are needed to replace the amount of commercial feed needed in large quantities. One of the alternative feed sources is fermented cocoa husk. [6] stated that the protein content in cocoa skin is very high so it is good if processed into animal feed. Fish feed that utilizes local raw materials can save aquaculture production costs by 25-35% [7].

Fermented feed is one of the feeds that contains high protein value which can improve feed quality [8]. The same thing was also said by [9] that fermentation is a method to increase the nutritional value according to its characteristics. Fermentation is a process of preserving feed by giving starters (microorganisms) which is carried out anaerobically [10]. According to [11] the notion of fermented feed is feed that has been treated with the addition of microorganisms or enzymes until biochemical changes occur and will subsequently result in significant changes in feed ingredients.

Cocoa (*Theobroma cacao*) is one of the export commodity fruit crops from Lampung Province. Cocoa husks are currently used as animal feed and compost. Whereas in terms of its potential cocoa skin can be used as an alternative material that can be used as raw material for fish feed. However, the nutritional content of cocoa shells is still low, so a process is needed to increase the nutritional value of cocoa shells by carrying out a fermentation process which is expected to increase the nutritional content and reduce crude fiber in cocoa shells to be easily digested by fish [12].

Fermented cocoa rind is a source of plant-based feed that is easy to obtain and cheap, besides that the fermentation method is not too complicated with the high protein content in the cocoa rind [13]. About 8-10% of cocoa bark is available in abundance in areas in Indonesia and has not been utilized properly [14]. Therefore, the authors are interested in conducting research on the use of fermented cocoa skin as raw material for carp feed. This research is useful as information about alternative feed sources in fish farming.

2. Materials and Methods

Time and place

This research was conducted from June to July 2022. The research was carried out at the Laboratory of the Faculty of Agricultural Sciences, Islamic University of Kebangsaan Indonesia, Jeupam District, Bireuen Regency.

Experimental design

The method used in this study was a completely randomized design (CRD) with 4 treatments and 3 replications where treatment consisted of treatment P1: control, treatment P2: 35% fermented cocoa husk + 65% commercial pellet feed, treatment P3: 40% skin fermented cocoa + 60% commercial pellet feed, treatment P4: 45% fermented cocoa husk + 55% commercial pellet feed.

Work procedures

The implementation of this research began with the preparation of containers in the form of an aquarium with a container size of 40x40x30 cm with a water level of 15 cm in each container. The biota used are goldfish seeds with the number of fish used in each container as many as 15 fish with a size of 3-5 cm. The feed given to goldfish seeds is in the form of artificial feed mixed with fermented cocoa husk flour. The mixture of flour and commercial feed is stirred until evenly mixed. The mixture of raw materials is then fed into the feed printer. The feed is printed according to the

fish's mouth opening. Feeding with a frequency of 2 times a day, namely at 08.30 WIB and 16.00 WIB.

The parameters observed were the growth rate of fish in the form of length growth and weight gain as well as the survival rate of fish. Observations of seed growth and weight gain of carp were carried out every day. The daily growth process is recorded and documented. Furthermore, the survival of goldfish fry was observed for a period of 30 days. Observations of survival were observed at the beginning of maintenance and at the end of maintenance. Live and dead fish will be recorded and documented.

Data Analysis

Observational data are tabulated in the form of a table or presented with a graph. Data analysis used a completely randomized design. If the calculated F value > F table value or shows a significant effect between treatments, then the data analysis is carried out using the Tukey mean test.

3. Results and Discussion

1. Growth of Goldfish Seeds

The growth of carp fry in the form of weight gain, length growth and survival is presented in Table 1. The results of observations during the study showed that the weight gain, and the length growth of carp fry showed differences between treatments. The results showed that treatment P4 using 45% cocoa husk + 55% commercial feed was a treatment that showed a significant growth value of fish fry and the best survival of goldfish seeds was found in treatments P3 and P4 (Table 1).

Table 1. Growth and Survival of Goldfish

Parameter	Treatment			
	P1	P2	P3	P4
Weight Gain (gr)	2,154	2,761	3,471	3,671
Growth Length (cm)	2.18	2.82	3.55	3.75
Life sustainability (%)	81	87.75	97.12	98.10

The best weight gain in treatment P4 with an average value of weight gain of 3.671 g with fermented cocoa skin feed 45% and 55% pellet feed, proving that the nutritional quality of feed is more balanced so that fish can take advantage of nutritional intake from feed properly and meet nutritional needs needed so that it affects growth, because the growth factor is strongly influenced by the ability of fish to digest and utilize feed properly. This is in accordance with the opinion [15] which states that the increase in fish body weight gain is closely related to the fish's ability to utilize and digest the feed provided and the feed itself will be beneficial if other factors are in the body. The results of the study [16] on the use of cocoa rind as fish food additives showed significant results at high doses. This condition is in accordance with the results of research [17] that the growth performance of carp is influenced by the protein content of the artificial feed given. According to [18] growth will occur if the protein needed to replace damaged cells in the fish's body has residual protein to increase tissue mass which will increase the weight of the fish. Based on statistical analysis showed that the feeding of fermented cocoa skin and pellets showed a very significant effect on the weight gain of carp (*Cyprinus carpio*) with a value of Fcount (This condition is in accordance with the results of research [17] that the growth performance of carp is influenced by the protein content of the artificial feed given. According to [18] growth will occur if the protein needed to replace damaged cells in the fish's body has residual protein to increase tissue mass which will increase the weight of the fish. Based on statistical analysis showed that the feeding of fermented cocoa skin and

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The best carp length growth was found in treatment P4 with an average length of 3.75 cm, then treatment P3 3.55 followed by treatment P2 2.82, and the lowest was found in treatment P1 control, which was 2.18 cm. Feeding fermented cocoa skin and pellets can have a high effect on the length increase of carp (*Cyprinus carpio*). [19] stated that cocoa pods need to be fermented first to reduce the levels of lignin which are difficult to digest by fish and can increase the protein content from 6-8%. Meanwhile, in treatment A, the control with the lowest weight was suspected because the pellet feed had not been able to meet the needs of tilapia and could not utilize the feed properly so that the weight gain was slow. Therefore, if the feed given has good nutritional value, it can accelerate the rate of growth because these substances will be used to produce energy to replace damaged body cells. The nutrients needed are protein, fat, carbohydrates, vitamins, minerals [20]. Based on statistical analysis showed that the feeding of fermented cocoa skin and pellets showed a very significant effect on the weight growth of carp (*Cyprinus carpio*) with a value of F_{count} (167,865) < F_{table} (4.07).

According to [21] that the level of digestibility of a type of feed depends on the quality of the feed, the composition of the feed ingredients, the nutritional content of the feed, the type and activity of digestive enzymes, the size and age of the fish, as well as the physical and chemical properties of the waters. The high level of feed consumption can affect the growth rate of the carp. This is because the feed made at that dose has a feed texture that is preferred by fish. This is reinforced by [22], differences in the level of feed consumption can be influenced by the content and physical characteristics of the feed such as size, shape, color, texture, taste and smell. Feed consumption is strongly influenced by feed quality and feed rate in the digestive tract. [23] suggested that in rations containing high fiber,

The best survival of carp (*Cyprinus carpio*) fry was found in treatment P4 and treatment P3 with a survival percentage of 98.10 and 97.12%, then in treatment P2, namely 87.75% and the lowest in the control treatment, namely 81%. . The survival of tilapia in the control treatment was lower than the other treatments. However, the overall survival of carp (*Cyprinus carpio*) was very good in the presence of an appropriate mixture of the nutritional composition of pellet feed with fermented cocoa pods. [22] stated that the use of feed that has sufficient nutritional value will affect the growth and survival of fish. According to [24], feed is a determinant of growth and is the biggest cost in production (60-70%). The survival rate of fish is influenced by environmental factors, such as water handling and quality. Improper handling can cause stress for fish, so that fish health conditions decline and can cause death [25]. Based on statistical analysis showed that the feeding of fermented cocoa skin and pellets showed significant results on the survival of carp (*Cyprinus carpio*) with a value of F_{count} (7.167) < F_{table} (4.07).

4. Conclusion

Based on the research results, it can be concluded that the addition of fermented cocoa skin into commercial feed affects the growth and survival of carp, where the higher the treatment dose, the higher the value of growth and survival of carp. The best treatment in this study was in treatment D with the use of a dose of 45% fermented cocoa husk + 55% commercial pellet feed.

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