

## Growth, Carcass and Feed Consumption of Native Chicken Given Feed Containing Fermented Cocoa Husk Flour

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### ABSTRACT

The improvement of the performance of native chicken needs to be balanced with the improvement of its ration. The ingredients of the ration used do not need to be expensive, but good quality, easy to obtain, and available throughout the year. One of the feed ingredients that is widely available and is waste is Cocoa skin. Fermented Cocoa skin has a nutritional content of 2.63% crude fat, 20.14% crude fiber, 10.39% crude protein, calcium 7.18%, and phosphorus 2.06%. Cocoa skin, in addition to its high crude fiber, also contains antinutrients in the form of tannins. Therefore, fermentation is necessary. The design used in this study was a Completely Randomized Design (CRD) with 5 (five) treatments and 3 (three) replications. The variables observed were Growth, ration consumption, protein consumption, Whole carcasses harvested when the chickens were 10 weeks old. The provision of fermented Cocoa skin up to 10% did not give a significant effect ( $P>0.05$ ) on weight gain, final body weight, and whole carcass weight of native chicken aged 3-10 weeks. However, the provision of fermented Cocoa skin flour gave a significant effect on ration consumption, protein consumption, and energy consumption in native chicken aged 3-10 weeks. The best provision was obtained in the treatment of provision of fermented Cocoa skin flour as much as 5%

## INTRODUCTION

Native chicken is one of the local poultry that is generally kept by farmers in rural areas. Native chicken is kept as a producer of consumption eggs, hatching eggs and meat. In addition to being able to be worked on as a side job, it is easy to maintain with simple technology, and can be sold at any time for urgent needs (Kartasudjana and Suprijatna, 2005), native chicken farming has promising prospects, both economically and socially, because its products in the form of meat and eggs are highly nutritious food ingredients and the demand is quite high. One of the native chickens that is widely developed now is the native chicken. The types and appearances of native chickens are very diverse, as are their genetic traits. Native chicken has several advantages compared to broiler chickens, in terms of taste, native chicken is more delicious and is preferred by the community. Triswi (2016) stated that native chicken has faster growth than local native chicken.

Based on data from the Central Statistics Agency, the production of local chicken meat in Bali in 2020 was 3,313.24 tons. The increase in population and the level of poultry meat production need to be balanced with an increase in the availability of feed. Native chickens require quality feed to fulfill their nutrition in order to get optimal results. Native chickens in their maintenance require quality feed to their nutrition, because perfect feed with balanced nutrient content will provide optimal results. The reality currently faced is that the price of commercial feed on the market is very expensive. Feed is the largest component in the poultry farming business, the cost of feed can reach 60-70% of the total production cost, so it is very important to find other alternatives in the availability of feed ingredients for rations. Efforts to overcome the feed problem by utilizing the potential of existing local feed ingredients, one of which is by utilizing food crop waste in the form of waste from cocoa skin (Towaha and Rubiyo, 2014)

Cocoa plants (*Theobroma cacao* L) or commonly called chocolate are plants that grow in tropical areas. In Indonesia, cocoa plants themselves are mostly spread across several islands throughout Indonesia, including Java, Sumatra, Kalimantan, Sulawesi, and Papua. Based on a field survey, cocoa fruit skins are simply thrown away, without anyone using them. The potential of cocoa fruit skins can be used as alternative feed for livestock, both ruminants and poultry. The availability of cocoa fruit skins is quite abundant because around 75% of a whole cocoa fruit is in the form of fruit skins, while cocoa beans are 23% and placenta is 2%. The composition of cocoa fruit consists of 74% skin, 24% cocoa beans and 2% placenta. Based on this composition, cocoa fruit skins are the largest composition of cocoa fruit production (Agbeniyi et al., 2011). Kamelia and Fathurohman, (2017) reported that cocoa contains 22% protein and 3-9% fat. The potential of this nutritional content allows it to be used as alternative feed for livestock. Cocoa waste can produce concentrate materials that are relatively affordable. According to Guntoro (2006), the use of waste can increase productivity (growth, milk production, eggs, etc.).

The availability of cocoa pods is quite abundant because around 75% of a whole cocoa fruit is in the form of pods, while cocoa beans are 23% and placenta is 2% (Qomariyah, 2021). In terms of the content of nutrients, cocoa pods can be used as feed because they contain 11.71% crude protein, 20.79% crude fiber, 1.80% fat and BETN 34.90% (Nuraini & Mahata 2009). Meanwhile, according to Oddoye et al. (2013), the nutritional content of cocoa pods is Dry Matter 19.40% BETN 41.20% Crude Protein 7.35% Crude Fat 1.42% Crude Fiber 33.10% and Ash 9.89%.

The use of cocoa pod skin as feed will provide two main impacts, namely increasing the availability of feed ingredients and reducing environmental pollution due to poor disposal of cocoa pod skin. However, in its use as feed ingredients, there are major obstacles, namely high lignin content and low protein (Nelson and Suparjo, 2011).

One method that can be used to reduce high lignin content and increase protein content is by fermentation. Fermentation is a biological processing, namely processing by utilizing microorganisms that will produce enzymes to change complex molecules such as proteins, carbohydrates and fats into simpler molecules. Microorganisms that can be used for fermentation are *Aspergillus niger*. The use of cocoa skin through the fermentation process is expected to increase the potential of cocoa skin as an alternative high-quality feed ingredient and can affect the protein, fat and crude fiber content of cocoa skin (Agyente-Badu, 2005). Agbeniyi et al., 2011 reported that cocoa skin fermented using *Aspergillus niger* was able to increase the nutritional value of cocoa skin waste, namely the protein content increased from 9.88% to 17.12% and the crude fiber content decreased from 7.10% to 4.15%.

In the preparation of poultry rations, the energy and protein content must be considered. Energy will limit ration consumption, the higher the energy content of a ration, the lower the ration consumption will be. Therefore, the balance of energy and protein must be balanced. The metabolic energy value of feed ingredients is the most applicable for use in poultry as a basis for ration preparation.

Based on the description above, a study was conducted on the provision of fermented cocoa skin as a substitute in native chicken feed for the final weight gain, carcass and amount of feed consumption of super native chicken rations.

## LITERATURE REVIEW

### Native Chicken

Native Chicken is one type of local chicken that is widely cultivated in Indonesia (Iskandar, 2006). This type of chicken is widely found in various regions, both rural and urban areas, in addition to rural and urban areas, Native Chicken can also be found in the highlands and lowlands. The wide distribution of Native Chicken potential source to meet the animal protein needs of the Indonesian people.

The characteristics of native chicken are that it can be produced in large quantities with uniform weight, faster growth rate than native chicken, has a low mortality rate, is easy to adapt to the environment and has a taste that is not different from native chicken (Kaleka, 2015). The harvest age of native chicken is approximately two months (Munandar and Pramono, 2014). The advantages of native chicken when compared to native chicken are greater body weight, lower feed conversion value and lower mortality value (Gunawan and Sartika, 2001).

### Cocoa Skin

Cocoa fruit skin has a nutritional composition equivalent to the nutritional composition of grass, so it has great potential as an alternative feed to replace grass (Puastuti & Yulistiani 2011). KCocoa fruit skin can be used as feed because it contains 11.71% crude protein, 20.79% crude fiber, 1.80% fat and 34.90% BETN (Nuraini & Mahata 2009). Meanwhile, according to Oddoye et al. (2013), the nutritional content of Cocoa skin is Dry Matter 19.40% BETN 41.20% Crude Protein 7.35% Crude Fat 1.42% Crude Fiber 33.10% and Ash 9.89%. However, cocoa skin has low digestibility and anti-nutritional compounds that affect the availability of nutrients. In addition, the availability of cocoa skin is only during the cocoa harvest season. The use of cocoa skin for ruminant livestock feed is not widely known by farmers and livestock breeders so that its use is still limited to certain groups of farmers. The use of cocoa skin as a substitute for grass or additional feed can support the productivity of ruminant livestock, especially goats (Puastuti et al. 2010; Suparjo et al. 2011).

## METHODOLOGY

### Materials and Tools

The design used in this study was a Completely Randomized Design (CRD) consisting of 5 treatments and 3 replications. The treatments were rations without the addition of fermented Cocoa husk flour (R0), rations containing 2.5% fermented Cocoa husk flour (R1), rations containing 5% fermented Cocoa husk flour (R2), rations containing 7.5% fermented Cocoa husk flour (R3), rations containing 10% fermented Cocoa husk flour (R4). Each treatment was repeated 3 times, so that there were 15 cages and each treatment was filled with 5 native chickens, so that a total of 75 native chickens were used. Chickens were given treatment starting at 3 weeks of age, and at 9 weeks of age feces were collected. The composition of feed ingredients and the composition of feed substances in the ration of 3-week-old native chicken treatments can be seen in Tables 3.1 and 3.2. The ration is made so that the ration has almost the same protein content (iso protein) and also Iso calories. This aims to make the use of fermented Cocoa skin have a clear effect.

The ration used in this study was a self-mixed ration of ground corn, bran, soybean meal, fish meal, minerals and coconut oil and fermented cocoa skin flour. Rations and drinking water were given ad libitum.

Table 1. Composition of Ingredients in Rations

Feed Ingredients	Treatment				
	R0	R1	R2	R3	R4
Commercial Feed 511	43	43	43	43	43
Corn (%)	28	25.5	23	20.5	18
Fermented Cocoa Husk Flour (%)	0	2.5	5	7.5	10
Rice Bran (%)	13	13	13	13	12.5
Fish Meal (%)	14	14	14	14	14
Coconut oil (%)	1	1	1	1	1.5
Minerals (%)	1	1	1	1	1
Total (%)	100	100	100	100	100

Description:

- R0 = ration without the addition of fermented cocoa husk flour.
- R1 = ration containing 2.5% fermented cocoa husk flour.
- R2 = ration containing 5% fermented cocoa husk flour.
- R3 = ration containing 7.5% fermented cocoa husk flour.
- R4 = ration containing 10% fermented cocoa husk flour.

Table 2. Composition of Research Ration Content

Nutrients	Treatment					Standard*
	R0	R1	R2	R3	R4	
ProteinRough	20.56	20.61	20.61	20.66	20.68	18
Metabolic Energy	3005	2974	2943	2913	2916	2900
Crude Fiber	4.4	5	5.4	5.8	6.3	7
Fat	4,995	5,5883	5.8286	6,0594	6,1782	3-5
Ca	1,2107	1,2877	1,4904	1.6855	1,5844	1
P	0.5935	0.6038	0.6612	0.72065	0.636	0.4

Source: Udayana University Laboratory Analysis Results (2023)

### Materials and Tools

The materials and tools used in this study were free-range chickens, cages and equipment, trays, plastic and scales, knives, paper and pens.

## Work Steps

The work steps are:

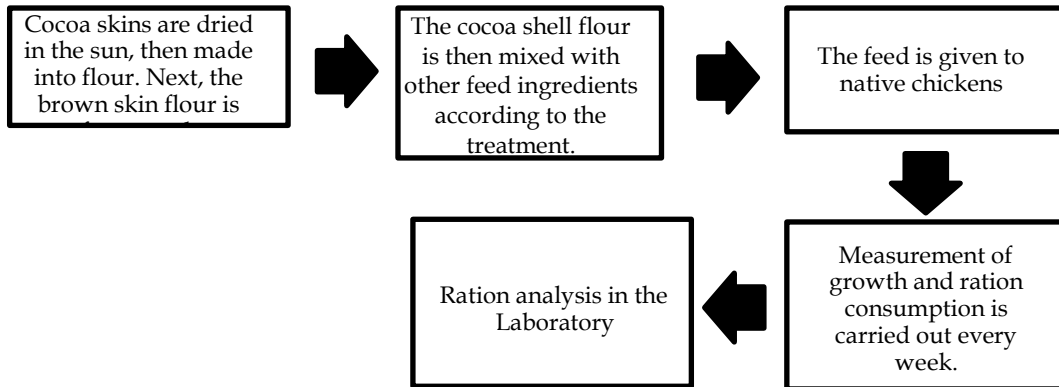


Figure 1. Work steps

## Observed Variables

The parameters observed were weight gain, total weight, protein consumption and energy consumption as well as ration consumption.

1. Weight gain: calculated by subtracting the final weight from the initial weight.
2. Whole weight: whole weight is a whole chicken that has only been removed from the digestive tract. This whole chicken is usually used as a ceremonial tool in Bali. Also, this whole chicken is a chicken that is usually sold in markets/supermarkets.
3. The amount of ration consumption is calculated by subtracting the amount of ration given from the amount of remaining ration.
4. Amount of protein consumption: calculated by multiplying the crude protein content of the ration by the amount of ration consumption.
5. Total energy consumption: calculated by multiplying the energy content of the ration.

## Statistical Analysis

The data obtained from the research results were analyzed using variance analysis. If there were significantly different results ( $P < 0.05$ ) between treatments, Duncan's multiple range test was carried out (Stell and Torrie, 1989).

## RESULTS

The results of the analysis of variance showed that the provision of fermented Cocoa flour did not show a significant effect ( $P < 0.05$ ) on the weight gain of native chickens aged 3-10 weeks. The final body weight of chickens treated with fermented Cocoa husk flour in the ration showed no significant effect ( $P > 0.05$ ). The effect of the provision of fermented Cocoa husk flour showed a significant effect ( $P < 0.05$ ) on the amount of consumption of rations of native chickens aged 3-5 weeks. The effect of the provision of fermented Cocoa husk flour on the amount of protein consumption in rations of native chickens aged 3-10 weeks showed a very significant effect ( $P < 0.01$ ). From the analysis of variance, it was obtained that the provision of fermented Cocoa husk flour had a significant effect ( $P < 0.05$ ) on the amount of energy consumption during the study. The results of the study are presented in Table 1.

Table 3. Effect of Giving Fermented Cocoa Skin Waste Flour on the Growth and Carcass and Feed Consumption of 10-Week-Old Native Chickens

Observation Variables	Treatment					SEM 3)
	R01)	R1	R2	R3	R4	
Weight gain (g/head)	689.27a 2)	677.41a	689.30 a	669.52a	663.95a	18.20
Final Body Weight (g/head)	866.80a	867.21a	870.85a	851.98a	848.23a	32.66
Carcass with head and feet (g/head)	614.03a	614.55a	614.93a	613.17a	605.3a	20.50
Ration Consumption (g/head)	2948.27a	2950.97a	2898.01a	2870.08	<b>2866.1</b>	35.83
Protein Consumption Amount (g/head)	589.95a	573.96a	544.54ab	528.33ab	502.13b	12.88
Total Energy Consumption (g/head)	9679.88a	9302.0ab	9019.11b	9106.78b	9176.32ab	128.48

Information :

### 1. Treatment

R0 = ration without the addition of fermented cocoa husk flour.

R1 = ration containing 2.5% fermented cocoa husk flour.

R2 = ration containing 5% fermented cocoa husk flour.

R3 = ration containing 7.5% fermented cocoa husk flour.

R4 = ration containing 10% fermented cocoa husk flour.

### 2. Numbers with the same letters indicate no significant difference ( $P > 0.05$ )

### 3. SEM (Standard Error of the Treatment Means)

## DISCUSSION

### Weight Gain

The results of the analysis of variance showed that the provision of fermented Cocoa flour did not show a significant effect ( $P < 0.05$ ) on the weight gain of native chickens aged 3-10 weeks. The highest weight gain was obtained in the R2 treatment (5% fermented Cocoa flour). The provision of R3 and R4 resulted in lower weight gain compared to R0, R1 and R3. Chickens given treatment above 5% experienced a decrease in weight gain. Ichwan (2003) stated that, in general, weight gain will be influenced by the amount of feed consumed and the nutritional content of the feed. Increased weight gain is influenced by feed consumption if feed consumption is good then weight gain will also be good. Weight gain is caused directly by the availability of tissue-forming amino acids, so that consumption of ration protein is directly related to weight gain. The less protein consumption will further reduce the weight of the chicken. In this study, it was clear that the weight of the chicken decreased along with the decrease in the amount of protein consumed (Anggorodi, 1995)

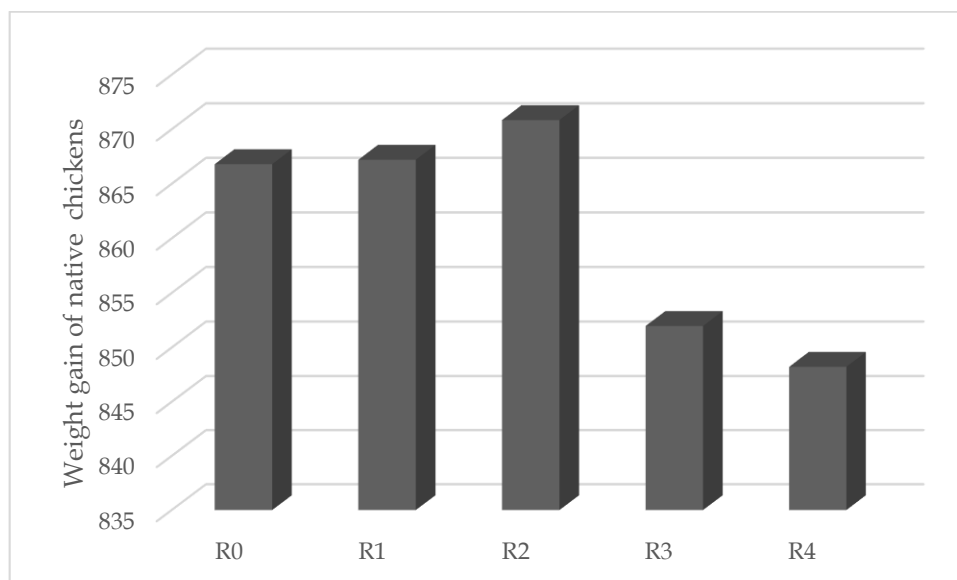


Figure 2. Weight Gain of Native Chickens Treated with Fermented Cocoa Skin Flour

### Final Body Weight

From the results of the analysis of variance, it was obtained that the final body weight of chickens treated with fermented Cocoa skin flour in the ration showed no significant effect ( $P > 0.05$ ). The highest body weight was obtained in the R2 treatment (5% fermented Cocoa skin flour), which was 870.85 grams/head. The final body weight of 10-week-old native chickens decreased after being given fermented Cocoa skin flour in the ration above 5%, although it showed no significant difference. This may be due to the high crude fiber content in the ration, which increases the rate of digesta so that food will pass quickly after being consumed. Fermented Cocoa Skin can increase nutrient content, such as crude protein and total

digestible nutrients (TDN), which are important for chicken growth. Research shows that fermented Cocoa skin can increase the digestibility and nutritional value of feed, so that chickens can absorb more nutrients from the feed given (Koni et al., 2019).

### **Whole Carcass Weight**

From the results of the analysis of variance, it was obtained that the final body weight of chickens treated with fermented Cocoa skin flour in the ration showed no significant effect ( $P > 0.05$ ). The highest body weight was obtained in the R2 treatment (5% fermented Cocoa skin flour), which was 614.93 grams/head. Carcasses with heads and feet are called whole carcasses or whole chickens. This term refers to chicken meat that still includes the head and feet, although in practice, carcasses are usually sold without these parts. Whole carcasses are chicken meat that has been cleaned of feathers and innards, but still includes the head and feet, unlike carcasses that generally do not have these parts. In Bali, this whole carcass is used as a requirement for ceremonial chickens. The weight of the whole carcass decreased after treatment (R2), namely the provision of 5% fermented Cocoa skin flour.

Cocoa skin, although useful as feed, can contain anti-nutritional compounds that can affect chicken health if not processed properly. Fermentation can help reduce the levels of these compounds, but if the fermentation process is not carried out properly, side effects such as digestive disorders can occur. The average carcass weight is closely related to the slaughter weight, the higher the slaughter weight, the higher the carcass weight. This is in accordance with the opinion (Akmal, 2008) that the slaughter weight is closely related to carcass weight. The various use of protein levels in rations results in various carcass weights. This is because in the digestion process, protein is converted into amino acids so that bones and meat are formed. This is in accordance with his opinion (Qotimahet al., 2014) that ration protein can affect carcass weight. Amino acids are the main ingredients in the meat formation process (Adnyana et al., 2014).

### **Ration Consumption**

The Effect of Giving Fermented Cocoa Husk Flour showed a significant effect ( $P < 0.05$ ) on the amount of consumption of rations for native chickens aged 3-5 weeks. The lowest amount of ration consumption was obtained in the R2 treatment (5% Cocoa Husk Flour in the ration) which was 2898.01 grams per head. The highest ration consumption was obtained in the R4 treatment (10% fermented Cocoa Husk Flour) which was 3103.40 grams, followed by R3 of 3005.27 grams, R1 of 2950.97 grams, R0 of 2948.27 grams and R2 of 2898.01, and statistically showed a significant difference ( $P < 0.05$ ). This can indicate that chicken ration consumption increases with increasing levels of fermented cocoa husk flour in the ration. It is suspected that the decrease in ration consumption is influenced by the palatability of the treatment ration. The palatability of the ration is influenced by the shape, smell, taste and temperature of the ration given (Martini, 2002). Furthermore (Anggorodi, 1995) stated that feed consumption is influenced by the form and physical of feed, and the chemical composition of the ration,

frequency of administration and anti-nutrients in the ration. The crude fiber content of the treatment ration (Table 1.) increased in line with the increasing level of cocoa pod husk flour fermentation, the low energy content of the ration will increase the level of ration consumption.

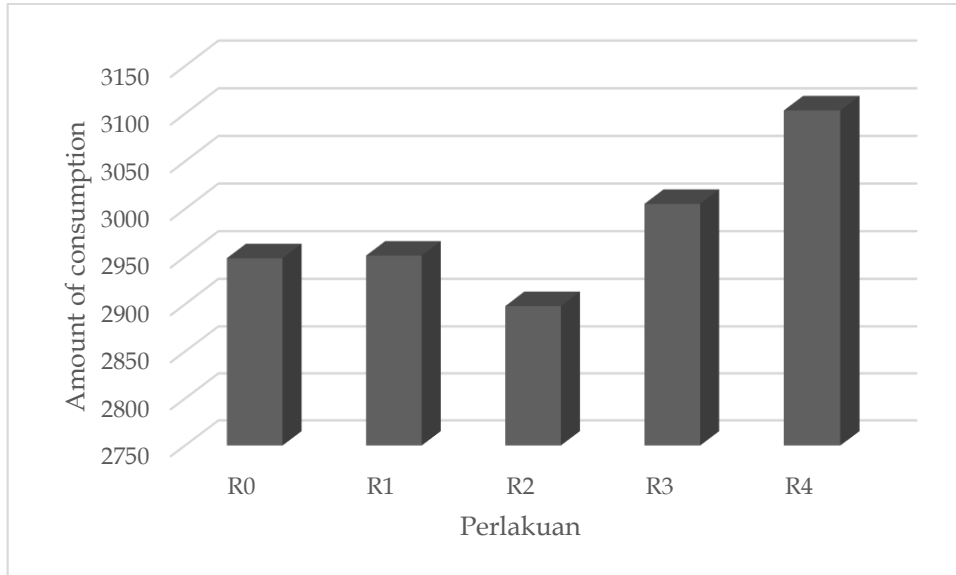


Figure 3. Amount of Consumption of native Chicken Rations Given Fermented Cocoa Skin Flour Treatment

Anggorodi (1995) stated that ration consumption is influenced by the form and physical of the feed, and the chemical composition of the ration, frequency of administration and anti-nutrients in the ration. The increase in ration consumption is likely due to the fragrant smell of rations containing fermented Cocoa flour. Fermentation is a biological processing, namely processing by utilizing microorganisms that will produce enzymes to change complex molecules such as proteins, carbohydrates and fats into simpler molecules (Guntoro and Yasa, 2005).

The increase in feed consumption is caused by the fermentation results that can improve the nutritional quality of feed ingredients. This can increase the appeal of feed so that feed consumption also increases. Rations that have a good taste will make chickens consume a lot of it and vice versa. Fermentation can change the nutritional content and improve the taste of azolla flour, thereby increasing the deliciousness of feed and increasing feed consumption.

The results of the study are supported by the results of research by Dewi et al. (2009) that native chickens given rations containing a higher balance of energy and protein produced significantly higher body weight compared to rations containing a lower balance of energy and protein at the age of 8 weeks. This is in accordance with the opinion (Revelation, 1992) which states that the level of protein in the ration can affect the value of body weight gain and ration conversion. Sidadologist (2006) stated that the relationship between feed consumption and weight gain is determined by feed conversion, rations with a low energy protein balance will result in lower ration conversion.

### Protein Consumption in Rations

The effect of giving fermented cocoa skin flour on the amount of protein consumption in the ration of super native chickens aged 3-10 weeks showed a very significant effect ( $P < 0.01$ ). The highest ration consumption was obtained in the R0 treatment (without fermented cocoa skin flour) followed by the R1, R2, R3 and R4 treatments, and statistically showed a very significant effect ( $P < 0.01$ ). Sufficient and high-quality protein consumption is very important to support optimal growth of native chickens, increase feed efficiency, and ensure chicken health and productivity. Sufficient and high-quality protein consumption is very important to support optimal growth of native chickens, increase feed efficiency, and ensure chicken health and productivity. Ria (2012) reported that fermented cocoa skin using *Aspergillus niger* was able to increase the nutritional value of cocoa skin waste, namely the protein content increased from 9.88% to 17.12% and the crude fiber content decreased from 7.10% to 4.15%

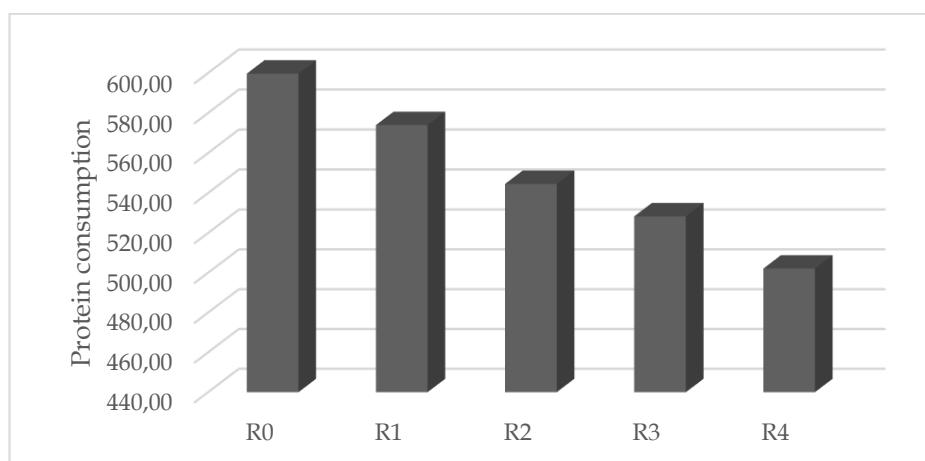


Figure 4. Protein Consumption of Super Native Chickens Treated with Fermented Cocoa Skin Flour

Feed consumption in chickens is influenced by the quality of the feed ingredients used. Rations with higher protein content tend to increase protein consumption because chickens will consume more feed to meet their nutritional needs. Conversely, rations with high crude fiber can reduce the amount of feed consumption. Protein consumption is also influenced by the balance between energy and protein in the ration. Rations that have a balanced energy and protein content will increase the efficiency of feed consumption. If the protein in the ration is too low compared to energy, then the chickens may not consume the optimal amount of feed, which can affect their growth and health. the higher the use of protein, the protein will be processed into more efficient results according to needs so that livestock are able to produce higher slaughter weights. Protein is one of the nutrients that can affect the growth and formation of carcass tissue, so that ration protein can affect the level of livestock body weight (Samsudin et al., 2016)

### Energy Consumption

From the analysis of variance, it was obtained that the provision of fermented Cocoa skin flour had a significant effect ( $P < 0.05$ ) on the amount of energy consumption during the study. The highest energy consumption was obtained in chickens with Treatment R0 where the amount of energy consumption was 9679.88 grams/head. Energy consumption decreased along with the addition of fermented Cocoa skin flour. Treatment R0 showed a significant effect with treatments R2, R3 and R4.

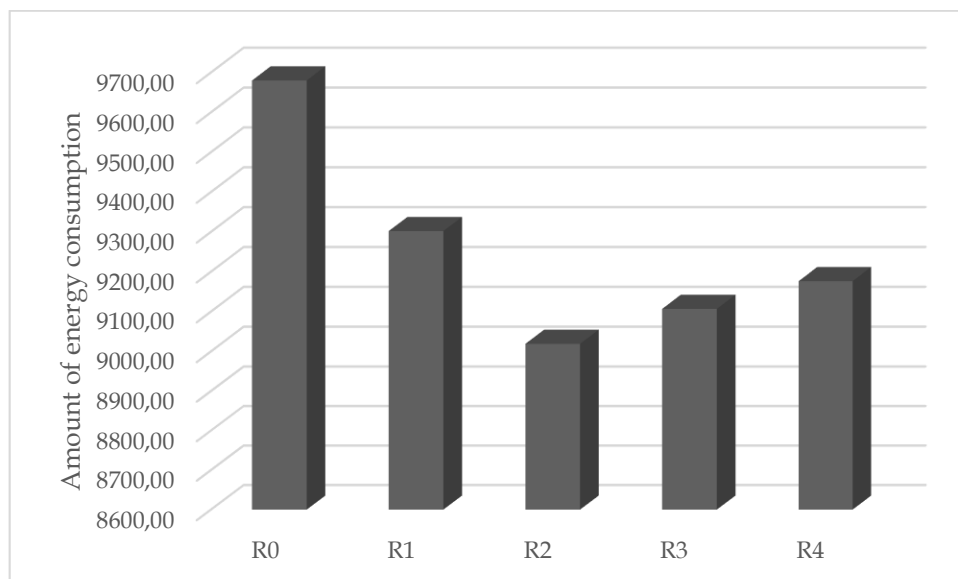


Figure 5. The Amount of Energy Consumption of Super Native Chickens Treated with Fermented Cocoa Skin Flour

The energy requirement for poultry is expressed in metabolizable energy (ME). Metabolizable energy is obtained by subtracting ration energy (GE) from excreta energy (feces and urine). If the energy requirement is met, the poultry will stop consuming the ration. The higher the energy content of the ration, the less ration is consumed because the poultry will reach energy satisfaction faster (Lokapirnasar, 2017).

High energy content of the ration can affect feed intake in several ways, but does not directly decrease it. Instead, feed intake tends to increase to some extent to meet the energy requirements required by poultry. Fermented Cocoa Husk can be used as an alternative feed to increase the growth of native chickens, especially in conditions where conventional feed is expensive. With proper processing, Cocoa Husk can be a nutritious and economical feed source. It is important to maintain a balance of nutrients in the ration. The addition of fermented Cocoa Husk must be balanced with other feeds to ensure that the chickens get all the nutrients needed for optimal growth. Overall, fermented Cocoa Husk has the potential to support the growth of native chickens, especially if used in the right proportion and combined with other feed ingredients to achieve a good nutritional balance.

## **CONCLUSIONS AND RECOMMENDATIONS**

The provision of fermented Cocoa skin up to 10% did not give a significant effect ( $P>0.05$ ) on weight gain, final body weight, and whole carcass weight of native chicken aged 3-10 weeks. However, the provision of fermented Cocoa skin flour gave a significant effect on ration consumption, protein consumption and energy consumption in native chicken aged 3-10 weeks. The best provision was obtained in the R2 treatment (5% fermented Cocoa skin flour). The provision of fermented Cocoa skin must be done by paying attention to the balance of nutrients in the ration. If the proportion of Cocoa skin is too high without other feed to balance it, this can cause a lack of important nutrients, such as protein or vitamins.

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