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Digestibility of Native Chicken Rations Containing Fermented Banana Peels

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A B S T R A C T

Improving the performance of super native chickens must be balanced by improving the ration. The ingredients used do not need to be "expensive" but are of good quality and readily available throughout the year. One of the feed ingredients that is widely available and is a waste is banana peel. Banana peels contain 3.63% nutrients, 2.52% crude fat, 18.71% crude fiber, 7.18% calcium, and 2.06% phosphorus. In addition to high crude fiber, banana peels also contain antinutrients in the form of tannins, hence the need for fermentation. To see the quality of the ration, it is necessary to test the digestibility. This research was carried out from March to July 2023. The design used in this study was a completely randomized design (CRD) with 5 (five) treatments and 3 (three) replicates. The treatments were as follows: R0 (ration without the addition of fermented banana peel flour/TKPF), R1 = (2.5% TKPF), R2 = 5% TKPF, R3 = 7.5% TKPF, R4 = 10% TKPF. Variables observed were N retention, protein digestibility, crude fiber digestibility, and organic matter digestibility. The results showed that the provision of fermented banana flour in the ration of native chickens significantly (P <0.01) influenced the digestibility of crude protein, crude fiber digestibility, digestibility of organic matter, and N retention of native chicken rations. The best results were obtained in the R2 treatment (5% Fermented Banana peel flour), where the crude protein digestibility gave results of 76.11%, crude fiber digestibility of 45.12%, organic matter digestibility of 70.09%, and N retention of 75.82%

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INTRODUCTION

One of the native chickens widely developed now is the super native chicken. Super-native chickens have several advantages compared to purebred chickens; in terms of taste, super-native chickens are more delicious and favored by the community. Triswi (2016) stated that super native chickens grow faster than local native chickens. According to data from the Central Bureau of Statistics, the quantity of native chicken meat produced in Bali in 2020 amounted to 3,313.24 metric tons. (Anom, 2020). The increase in population and poultry meat production levels needs to be balanced with increased feed availability. Super-native chickens require quality feed to fulfill their nutrition to get optimal results. However, the reality farmers face today is that commercial feed prices on the market are prohibitive. In a livestock enterprise, the expenditure on feed constitutes a substantial portion, ranging from 60% to 70%, of the overall production costs. Consequently, exploring alternate approaches for procuring feed constituents to be incorporated into the animals' diets becomes imperative (Suprijatna, 2010).

Banana peel represents a viable alternative feed element that can serve as an energy source within the ration, presenting a promising prospect. Based on the findings of Koni (2009), the banana peel was found to possess a crude protein content of 3.63%, crude fat content of 2.52%, crude fiber content of 18.71%, calcium content of 7.18%, and phosphorus content of 2.06%. Banana peels contain antinutrients, specifically tannins, and a crude fiber content. Tannin is classified as an antinutrient due to its ability to bond complexly with proteins, impeding their digestion by protease enzymes. Tannins are positively correlated with digestibility. Therefore, a fermentation step is needed to improve the nutritional quality of banana peels.

Banana peels have a high crude fiber content. Crude fiber confers several advantages, including facilitating intestinal peristalsis, mitigating ration clumping, expediting digestion, and promoting the growth of digestive organs (Amrullah, 2003). High crude fiber can carry digestible nutrients from feed ingredients out with the feeses before they are absorbed by the intestines (Wahyu, 2004). According to Udjianto (2003), with the application of fermentation technology using probiotics, the nutritional value of banana peel which was initially low, namely crude protein 6.56%, crude fiber 15.32%, fat 6.7%, and ash 11.15% can increase to crude protein 14.88%, crude fiber 11.43%, fat 7.0%, and ash 23.86% after fermentation.

LITERATURE REVIEW

The energy and protein content must be considered in preparing poultry rations. Energy will limit ration consumption; the higher the energy content of a ration, the lower the ration consumption. Therefore, the balance of energy with protein must be balanced. Determining the metabolic energy value of feed ingredients holds significant relevance in poultry, serving as a fundamental factor in formulating rations. The fundamental idea underlying the assessment of food substance digestibility involves quantifying the difference between the quantity of food taken and the quantity of food substances excreted in fecal matter (Subhan et al., 2010). The objective of assessing nitrogen retention in the ration is to evaluate the nutritional value of the provided diet. The fundamental idea underlying the assessment of food substance digestibility involves quantifying the difference between the amount of food taken and the number of food compounds expelled via fecal matter (Radjan, 1980). The primary aim of quantifying nitrogen retention within the diet is to evaluate the nutritional efficacy of the provided food regimen. The favorable influence of heightened protein retention on growth is well-established, as it is widely recognized that increased nitrogen retention plays a crucial role in this process.

If the digestibility value of a feed is poor, its high amount of feed ingredients becomes inconsequential, rendering the feed ineffective. The digestibility of feed ingredients refers to the extent to which the feed material contains nutrients that can be broken down and absorbed inside the digestive tract. This can vary between high and low levels, indicating the varying degrees to which the feed material can be effectively digested. Digestibility can be used as one way to determine the value of feed. Digestibility is also essential to know how much of the substances contained in feed can be absorbed for bare life, growth, and production (Hutabarat et al., 2018).

A study assessed the digestibility of rations and nitrogen retention in native chicken diets that incorporated fermented banana peel flour, as described above.

METHODOLOGY

This study was conducted from February to July 2023 in the livestock production barn of Warmadewa University Animal Husbandry Study Program; this study used 75 super-native chickens aged 3-10 weeks. Feces collection was done when the chickens were nine weeks old. Provisions of rations and potable water were provided without restriction.

The design used in this study was a completely randomized design (CRD) with five (5) treatments and three (3) replications. The treatments were as follows: R0 (ration without the addition of fermented banana peel flour/TKPF), R1 = (ration containing 2.5% TKPF), R2 = (ration containing 5% TKPF), R3 = ration containing 7.5% TKPF, R4 = (ration containing 10% TKPF.

The table below presents the composition of the ration and the nutritional content of the ration:

Table 1. Composition of Ration Ingredients

Feed Ingredients	Treatment				
	R0	R1	R2	R3	R4
Commercial Feed 511	30	30	30	30	30
Corn (%)	42	35,5	34	30,5	29,5
Fermented banana peel flour (%	0	2,5	5	7,5	10
Rice Bran (%)	11	15	14	15,5	14
Fish Flour (%)	15	15	14	15,5	14
Coconut Oil (%)	1	1	1	1	1
Minerals (%)	1	1	1	1	1
Total (%)	100	100	100	100	100

Table 2. Composition of Research Ration Content

Nutrients	Treatment					Standard[2)]
	R0 [1]	R1	R2	R3	R4	
Crude Protein	18,197	18,2652	18,1384	18,2408	18,159	18
Metabolic Energy	3071,45	3042,43	3054,16	3091,54	3092,32	2900
Crude Fiber	3,88	4,5043	5,2286	5,6604	6,4672	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: [1)] Udayana University Laboratory Analysis Results (2022)
[2)] Scott et al. l.

The work steps in this research are as follows:

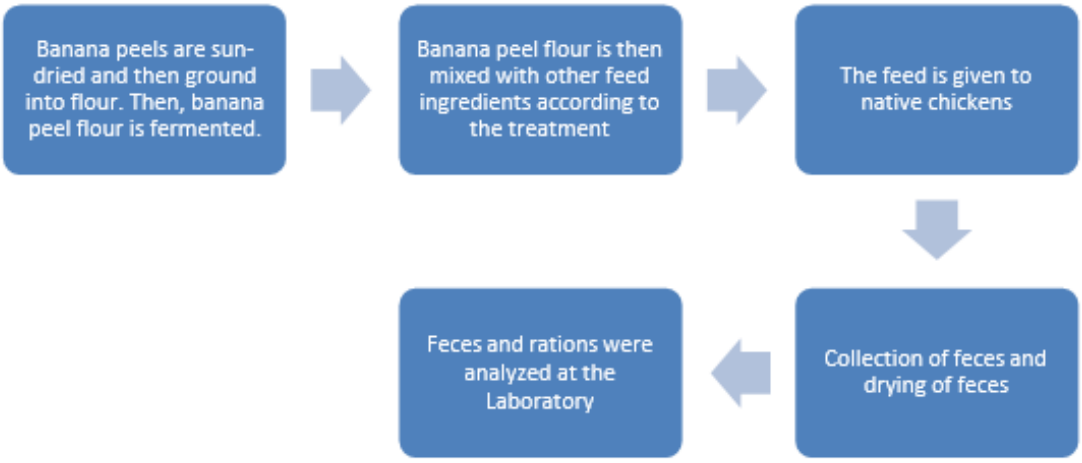

Figure 1. Research Work Step

The characteristics that were measured in this study included nitrogen retention, dry matter digestibility, crude protein digestibility, and organic matter digestibility of the ratio. The calculation of crude protein digestibility was performed using the formula Wahju (2004) described in the following manner:

1. Crude Protein Digestibility

$$\text{Crude Protein Digestibility} = \frac{Protein\ Consumption\ x\ Corrected\ Excreta\ PK}{Protein\ Consumption}\ x\ 100\%$$

Description:
PK consumed = crude protein content of the ration x amount consumed
Excreta protein = excreta amount x excreta PK
Urinary protein = 30% x excreta protein (Muller, 1982)
Corrected excreta PK = excreta PK - urine PK

2. Crude Fiber Digestibility

$$\text{Crude Protein Digestibility} = \frac{Crude\ Fiber\ Consumption\ x\ Excreta\ Crude\ Fiber}{Crude\ Fiber\ Consumption}\ x\ 100\%$$

The formula calculates Crude fiber digestibility (Tillman et al., 1991) as follows. Description: Crude fiber consumption = crude fiber content of ration xconsumption amount.
Excreta crude fiber = excreta count x excreta SK

3. Digestibility of Organic Matter

$$\text{Digestibility of Organic Matters} = \frac{Organic\ Matter\ Consumption\ x\ Excreta\ BO}{Organic\ Matter\ Consumption}\ x\ 100\%$$

Description:

Organic food consumption = Ration BO content x
Consumption amountExcreta BO = Excreta count x Excreta
BO

4. Nitrogen Retention
Nitrogen Retention (g) = N consumption - (N excreta - N endogenous)
Description:
N Consumption (g) = product of consumption rate and % ration nitrogen
Excreta N (g) = product of excreta amount and excreta nitrogen %.
Endogenous N (g) = product of excreta amount and % endogenous excreta nitrogen.

RESULTS AND DISCUSSIONS

The study's outcomes, which examined the effects of incorporating fermented banana peel flour into the diet of native chickens, are presented in Table 3. This table illustrates the impact of this dietary inclusion on the digestibility of crude protein, crude fiber, organic matter, and nitrogen retention in the rations:

Table 3. Digestibility of Crude Protein, Crude Fiber, Organic Matter, and N Retention of Native Chicken Ration Containing Fermented Banana Peel Flour

No.	Parameters	R0[1)]	R1	R2	R3	R4	SEM[2)]
1	Crude protein digestibility	71,54[b] 3)	68,59[c]	76,11[a]	74,06[a]	71,61[b]	0,93
2	Crude fiber digestibility	58,06[a]	48,32[b]	45,12[b]	45,72[b]	38,59[c]	1,63
3	Digestibility of organic matter	73,12[a]	69,64[a]	70,09[a]	68,55[a b]	63,88[b]	0,95
4	N Retention	71,04[b]	68,20[b]	75,82[a]	73,74[a]	72,83[a]	0,92

Description 1)SEM = Standard Error of Treatment Means
2)Different letters towards the row indicate significantly different (P<0,01)

Crude Protein Digestibility

The statistical technique known as analysis of variance was employed to examine the impact of different levels of fermented banana peel flour on the digestibility of crude protein in rations for native chickens. The results of this study indicated a significant influence (P>0.01) of the varying levels of fermented banana peel flour on the digestibility of crude protein. Giving 5% (R2) of fermented banana peel flour (TKPF) showed the highest result of 76.107%, followed by R3 (7.5% TKPF) of 74.06%, then R4 (10% TKPF) of 71.61%, at R0 (without TKPF) of 71.53% and the lowest at R1 (2.5% TKPF) of 68.59%, However, the data presented a statistically significant disparity in outcomes (P>0.01.

Crude protein digestibility of native chicken rations was obtained in the 68.58% - 76.11% range. This shows that adding fermented banana peel flour (TKPF) increased the crude protein digestibility of the ration. This may be due to

the fermentation process of banana flour so that the ration becomes easily digested and absorbed by livestock.

Fermented banana peel flour is a processed product from banana peels fermented using certain microorganisms. Fermentation can increase the nutrient content and reduce the anti-nutrient content of banana peels, so fermented banana peel flour can be a good source of protein and fiber for native chicken feed (Astuti, T. dan G. Yelni. 2015). These results show that the digestibility value of protein is high; according to Anggorodi (1994), the quality of rations based on the level of digestibility are three categories, namely: digestibility value in the range of 50-60% is low quality, between 60-70% medium quality and above 70% high quality.

A good crude protein digestibility value in native chicken rations is around 70- 80% (i Boangmanalu,dkk, 2016). Several factors, including feed type, feed quality, and the health state of the native chickens, can influence the digestibility value of crude protein in native chicken rations. Hence, it is imperative to conduct periodic monitoring and evaluation of the digestibility value of crude protein in the feeds of native chickens to maintain their maximum health and production.

In this study, the digestibility value of crude protein in the rations prepared ranged from 68% to 76%. This shows that the ratio is good. Adding fermented banana peel flour at the 5% level gave the highest crude protein digestibility of 76.15%. Up to the addition of 10% fermented banana peel flour, the crude protein digestibility of the ration was 71.61%. This shows that up to the addition of 10%TKPF, the resulting ratio is still good. Good crude protein digestibility indicates that livestock can digest and absorb most of the crude protein in the feed. The findings of this study indicate that the offered feed demonstrates a substantial concentration of protein and is readily assimilated by the physiological system of the animals.

Increasing the digestibility value of crude protein in poultry rations can be done by providing quality and balanced feed, feeding the right amount, feeding regularly, and providing sufficient access to clean water. In addition, using the right feed ingredients and the correct dose can also increase the digestibility value of crude protein in poultry rations. It is essential to pay attention to the digestibility value of crude protein in poultry rations because this can affect the growth and health of livestock and the quality of the products produced (Daud, M. 2018). By paying attention to the digestibility value of crude protein in poultry rations, farmers can increase feed efficiency and farm profits.

Crude Fiber Digestibility

The incorporation of different concentrations of fermented banana peel flour (TKPF) into the diets of indigenous chickens resulted in a statistically significant impact ($P>0.01$) on the digestion of crude fiber present in their feed. The treatment that demonstrated the most outstanding level of digestibility was R0, which did not involve using fermented banana peel flour. Subsequently, the study revealed that the occurrence of R1 (2.5% TKPF) was 48.32%, while R3 (7.5% TKPF) had a prevalence of 45.72%. Similarly, R2 (5% TKPF) exhibited a prevalence of 45.12%. However, R4 (10% TKPF) had a majority of 38.59%. The

statistical analysis indicated a substantial difference, as evidenced by a P-value over 0.01.

The value in R0 (without TKPF) showed the highest importance because the ration did not use fermented banana peel flour (TKPF), where the resulting roughage digestibility value was around 58.06%. Giving fermented banana peel flour in chicken rations can reduce crude fiber digestibility in broiler chickens. In addition, some studies show that the provision of fermented banana peel flour in the percentage of native chickens can reduce the digestibility of crude fiber in the ration of native chickens. Therefore, it can be assumed that providing fermented banana peel flour in backyard chicken rations can also reduce natural fiber digestibility in backyard chicken rations.

This study found that ration digestibility decreased with the higher use of fermented banana peel flour. In the control ratio (R0), the digestibility of dietary crude fiber obtained the highest value of 58.06%. The higher use of banana flour resulted in lower digestibility of dietary crude fiber, so the weakest results were obtained in treatment R4 (10% TKPF), which amounted to 38.59%. Crude fiber digestibility (CF) in good poultry rations can vary depending on the type of bird, age, and health condition of the livestock. Good natural fiber digestibility indicates that livestock can digest and absorb most of the crude fiber in the feed. This suggests that the meal provided has good fiber quality and is easily digested by the livestock's body (Qotimah S, 2000)

Increasing the digestibility value of crude fiber in native chicken rations can be done by providing quality and balanced feed, feeding the right amount, feeding regularly, and providing sufficient access to clean water. Furthermore, using appropriate feed ingredients and optimal dosages might enhance the digestibility coefficient of crude fiber in native chicken diets. The digestibility value of crude fiber positively correlates with the improvement in the quality of chicken feed. The digestibility of chicken feed is contingent upon the quality of crude fiber present in the feed. Therefore, paying attention to the quality of crude fiber in poultry feed is essential to providing optimal nutrition and supporting poultry health (Kaleka, 2020). Some factors that affect crude fiber digestibility in poultry include, Feeding rate, Animal species, Temperature: Feed composition: crude fiber content of feed ingredients (Wolayan, dkk; 2022).

Digestibility of Organic Matter

The statistical study revealed a significant impact ($P < 0.01$) of including different levels of fermented banana flour (TKPF) in the diet of native chicken on the digestibility of organic matter from their diet. The highest results were obtained in treatment R0 (0% TKPF), which amounted to 73.12%; R2 (5% TKDF) which amounted to 70.09%, R1 (2.5% TKDF) amounted to 69.64%, R3 (7.5% TKDF) amounted to 68.55%, and R4 (10% TKDF) amounted to 63.88%. However, the statistical analysis demonstrated a significant impact with a P-value of less than 0.01.

The digestibility of organic matter in native chicken rations decreased with increasing levels of fermented banana peel flour (TKPF) in the ration. In rations that did not contain fermented banana peel flour (TKPF), the digestibility of organic matter was 73.12%. The more the use of TKPF, the digestibility of

organic matter decreased until at R4 (10% TKPF), The digestibility of organic matter exhibited a modest value of approximately 63.88%. The digestibility value of the organic matter in poultry rations shows variability contingent upon the avian species and the specific feed administered, as indicated by the search findings. Some studies show the digestibility value of organic matter in poultry rations between 59% and 81.52% (Wolayan, dkk; 2022).

In general, there is a positive correlation between the digestibility value of organic matter in poultry rations and the overall quality of the feed. The digestibility of the feed consumed by hens is contingent upon the quality of organic matter in the ration. Hence, it is imperative to prioritize assessing organic matter quality in poultry feed to ensure the provision of appropriate nutrition and the maintenance of chicken health.

Based on the search results, no specific recommended organic matter digestibility values for poultry rations were found. However, the higher the digestibility value of organic matter in poultry rations, the better the feed quality (Parakasi, 1990). The digestibility of poultry feed depends on the proportion of organic matter present. Hence, it is imperative to prioritize the assessment of organic matter quality in poultry feed to ensure the provision of appropriate nutrition and the promotion of chicken health. Furthermore, the digestibility of organic matter in poultry rations can be impacted by various factors, including feeding rate, bird species, environmental temperature, food transit rate through the digestive tract, the present inquiry pertains to the physical attributes of feed materials, the composition of said feed, and the quantification of crude fiber content within such ingredients, nutrient deficiencies, feed ingredient processing, combined effects of feed ingredients, and digestive tract disorders (Wolayan, dkk; 2022). Therefore, it is necessary to adjust these factors to optimize the digestibility value of organic matter in chicken feeds is a significant factor to consider in poultry nutrition.

Nitrogen Retention

The statistical study, analysis of variance (ANOVA), demonstrated a statistically significant effect of varying amounts of fermented banana peel flour (TKPF) on nitrogen retention in native chicken diets. The experimental treatment, denoted as R2 (5% TKPF), had the highest level of nitrogen retention, with a rate of 75.82%. Subsequently, the sequence of rates observed was as follows: R3 (7.5% TKPF) exhibited a rate of 73.74%, R4 (10% TKPF) showed a rate of 72.83%, R0 (0% TKPF) displayed a rate of 71.05, and R1 (2.5% TKPF) manifested a rate of 68.19%. The findings of this study demonstrate a statistically significant variation ($P>0.01$) across the different treatment groups.

Using fermented banana peel flour (TKPF) up to the 5% level (R2) gave the highest N retention of 75.82%. This value was higher than the ratio that did not contain TKPF (R0), which was 71.04%. Based on the search results, no information directly explains how N retention in native chicken rations affects chicken growth. However, N retention in native chicken rations can indicate the efficiency of protein utilization in native chicken feed (Boangmanalu,2016).

Some factors that affect the growth of native chickens include feed quality, nutrient content in feed, crude fiber content of feed ingredients, feeding rate,

animal species, environmental temperature, and health of native chickens (Andre dkk, 2019). Therefore, to improve the growth of native chickens, it is necessary to pay attention to feed quality, nutrient content in feed, crude fiber content of feed ingredients, feeding rate, animal species, environmental temperature, and the health of native chickens.

Nitrogen retention is the ability of the livestock body to retain nitrogen in the body after consuming feed. Nitrogen is one of the essential elements in protein formation, so good nitrogen retention is significant for livestock growth and health (Sklan and Hurwitz, 1980)

The relationship between nitrogen retention and livestock growth is very close. Here are a few things that explain the connection.

1. Protein and growth: Protein is one of the essential nutrients livestock require for growth and development. Nitrogen is a crucial element in protein formation, so good nitrogen retention will help improve livestock growth.
2. Health: Good nitrogen retention can also improve livestock health. Adequate and quality protein will help increase the livestock's resistance to disease and environmental stress.
3. Feed efficiency: Good nitrogen retention can also improve feed efficiency in livestock. Livestock will be more efficient at converting feed into body mass, reducing feed costs and increasing farmer profits.
4. Product quality: Good nitrogen retention can also improve the quality of livestock products, such as meat and eggs. The products produced will be higher quality and more nutritious.

To improve nitrogen retention in livestock, farmers can do several things, such as providing quality and balanced feed, feeding the right amount, feeding regularly, and providing sufficient access to clean water. In addition, using the correct feed ingredients and the proper dosage can also increase nitrogen retention in livestock (Trisiwi, 2016)

The nitrogen (N) retention value in a good poultry ration can vary depending on the type of bird, age, and health condition of the livestock. However, generally, a good N retention value in poultry rations is around 70-80%. A good N retention value indicates that the animals can retain most of the nitrogen in the body after consuming the feed. This implies that the meal exhibits favorable protein content and is readily digestible by the livestock. Therefore, it is necessary to consider feed quality, nutrient content, crude fiber content of feed ingredients, feeding rate, animal species, environmental temperature, and poultry health to improve N retention in poultry rations. (Dewi & Wirapartha, 2014)

Increasing the value of N retention in poultry rations can be done by providing quality and balanced feed, feeding the right amount, feeding regularly, and providing sufficient access to clean water. In addition, using the right feed ingredients and the correct dose can also increase the value of N retention in poultry rations. (Andre,dkk;2019)

It is essential to pay attention to the N retention value in poultry rations because this can affect the growth and health of livestock and the quality of the

products produced. By paying attention to the N retention value of poultry rations, farmers can increase feed efficiency and farm profit

CONCLUSIONS AND RECOMMENDATIONS

The study's findings suggest that including fermented banana peel flour in the diets of native chicken results in a notable enhancement in crude protein digestibility and nitrogen retention, with statistical significance ($P<0.05$). However, it is noteworthy that this dietary intervention also significantly decreases the digestibility of natural fiber and organic ration matter ($P<0.05$). The treatment labeled as R2, which involved the utilization of rations containing 5% fermented banana peel flour, yielded the most favorable outcomes among all the administered treatments.

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