Protein Digestibility, Calcium and Phosphorus Retention in Rations using Gamal Leaf Flour and Cekuti Leaf Flour for Turkey Grower Poultry

Fadlu Muhammad Amrulloh[1], Istna Mangisah[1] dan Bambang Sukamto[1]
Faculty of Animal and Agricultural Sciences, Universitas Diponegoro Semarang
Corresponding author : Fadlumuhammad96@gmail.com

Abstract

This study aimed to determine the digestibility of crude protein, calcium and phosphorus retention in rations using gamal leaf and cekuti leaf flour on grower turkey poults. Animals used were 8 weeks old turkey, totaling 100 unsex. The study used a randomized block design (RBD) using 5 treatments and 4 groups. Grouping was based on body weights; group 1 has a weight of 725 - 849 grams, group 2 has a weight of 850 - 974 grams, group 3 has a weight of 975 - 1099 grams, group 4 has a weight of 1100 - 1224 grams, each group consisting of 25 turkeys. The treatments given include T0 = without any gamal and cekuti given, TI = giving rations with 5% gamal, T2 = giving rations with 10% gamal, T3 = giving ration with 5% of cekuti and T4 = giving ration with 10% of cekuti. The data obtained were carried out by the F test and Duncan's multiple range with a level of 5%. The results showed that the use of gamal leaf flour and scruff on the ration for grower turkey had a significant effect ($P<0.05$) on crude protein digestibility, calcium and phosphorus retention and in grower turkey. The conclusion is that as much of 5% gamal leaf flour can be used in turkey rations.

Keywords : Cekuti, crude protein, gamal, minerals and,

Introduction

Consumption of poultry meat in Indonesia in 2016 reached 0.111 kg / capita / week increased to 0.124 kg / capita / week in 2017 (BPS, 2018). The increase in demand must be balanced with an adequate amount of meat supply. The effort that can be done by the government is to increase the productivity of local poultry. Ways to increase the productivity of local poultry can be done by improving maintenance management, improving quality of the rations and genetics. One of the local poultry that has potential as meat-producing livestock is turkey.

Turkeys are birds originate from North America, belonging to the order Galliformes, genus Maleagris (Ali et al., 2018). Turkey has a very high protein content of 29.3%, fat 5%, so turkey meat is very good for maintaining blood sugar and cholesterol levels (Oktaviana et al., 2016). Turkey meat is a product of turkey bred for 3-4 months and weighs 5-6 kg. Turkey is a type of poultry that can consume large amounts of ration (Suprijatna et al., 2010). The problem often faced by breeders is the high price of rations. A turkey ration in the form of a mixture of rice bran, soybean meal, corn, poultry meat meal, premix and ration. The use of ration protein sources can be a solution to improve ration quality and reduce production costs. Rations that are often used to ration on turkeys are gamal leaves and cekuti leaves (Prayitno et al., 2016).

Gamal (*Gliricidia sepium*) is a legume plant that grows in the tropical area. Oval shaped gamal leaves have a pointed leaf tip, blunt leaf base, with leaf arrangement facing each other (Natalia et al., 2009). Gamal leaves have nutritional content in the form of crude protein (23-25%), crude fiber (13.3%), crude fat (3.10%), ash (8.4%) and calcium (1.71%) (Mayasari et al., 2012). Gamal leaves contain alkaloid compounds, dicoumerol poison, Hydro CyanicAcid (HCN), tannins and nitrates (NO3) (Khunaifi, 2010). Cekuti with Latin name is *Galinsoga parviflora* which spreaded south and central America, both in tropical or subtropical regions (Damalas, 2008). The results of the laboratory analysis of Ration Nutrition Science (2018) of the leaves have a nutritional content in the form of 2400 kcal / kg of metabolic energy, 26.09% of vrude protein, 2.8% of fat, 38.22% of crude fiber, 0.12% of calcium, 0.12% of calcium and 0 phosphorus of 4%. Cekuti leaves contain flavonoid compounds and polyphenols which are helpful to improve the digestive tract (Khunaifi, 2010).

The use of greens in turkey rations can reach up to 5% of the basal ration (Prayitno et al., 2016). The use of gamal leaf and cekuti leaf flour in the ration will increase the digestibility of of crude fiber that is usually very difficult to digest and decrease protein digestibility, calcium and phospor absorption (Wulandari et al., 2012). The tannin content in gamal can form complex bonds with protein, thereby reducing protein digestibility (Akmal and Mairizal, 2013). Low protein digestion can reduce calcium retention, because protein acts to bind calcium called calcium binding protein to be absorbed into the blood vessels (Febrianta, 2014). Phosphorus retention is strongly influenced by the comparison of calcium minerals with phosphorus and phosphorus consumption, the higher the consumption of phosphorus the more phosphorus retention increases (Yendy et al., 2014).

This study aimed to determine the digestibility of crude protein, calcium and phosporus retention using gamal leaf and cekuti leaf flour in turkey grower poultry.

Materials and Methods

This research was conducted from October 1 to November 10, 2018 in Dlikosari Village RT 04 RW 03 Blotongan, Salatiga. Research material used was 100 12 weeks old grower turkeys. Using a stage cage with each cage containing 5 turkeys, that feeder used was a made from pipe with a diameter of 4 inch which was restricted using wood. Equipment used for the total collection were battery cages, Fe2O3 indicator, ration, drinking containers, storage boxes and rations for each treatment. The ration used was composed of yellow corn, soybean meal, rice bran, poultry meat meal (PMM), premix, gamal leaf flour and cekuti leaf flour can be seen in Table 1, the nutritional content of turkey rations can be seen in Table 2.

The research method uses a completetely randomized design (RBD) using 5 treatments and 4 groups. Grouping was based on body weight; group 1 has a weight of 725 - 849 grams, group 2 has a weight of 850 - 974 grams, group 3 has a weight of 975 - 1099 grams, group 4 has a weight of 1100 - 1224 grams, each group consisted of 15 turkeys, with a body weight difference of 124 grams. The turkeys are kept for 8 weeks. The poultries were fed and given water on ad libitum.

Table 1. Grower turkeys rations

Ration material	Treatment

	T0	T1	T2	T3	T4
	---------- (%)----------				
Ground corn	60	63	58	50	60
Corn bran	15	10	7	25	11
Soybean meal	10	14	20	11.5	14
Poultry Meat Meal	10	5	0	5	0
Gamal leaf	0	5	10	0	0
Cekuti leaf	0	0	0	5	10
Premix	5	3	5	3.5	5
TOTAL	100	100	100	100	100

Table 2. Nutritional Value in Rations for Grower Turkeys

Nutritional Value*(%)	T0	T1	T2	T3	T4
Crude Protein	16.23	16.38	16.17	16.21	16.39
Crude Fiber	8.6	11.33	13.82	11.62	14.42
Crude Fat	7.94	7.64	7.02	7.53	6.91
Calcium	1.27	0.71	0.69	0.82	0.8
Phosphor	0.75	0.60	0.6	0.65	0.64
EM**(kkal/kg)	4367.71	4420.03	4309.6	4410.17	4309.23

Description : Approximate Data Results in Ration Nutrition Sciences Laboratory 2018.

The research treatments were based on the difference of the level of gamal and cekuti leaf in turkey rations, withT0 = 0%, T1 = gamal leaf level of 5%, T2 = gamal leaf level of 10%, T3 = 5% level of cekuti and T4 = 10% level of cekuti. Turkeys that have been kept for 4 weeks , from which 20 turkeys would be selected, representing each treatment and group, which wouuld be taken an excreta sample from with a total collection method of 3 days. The parameters observed in this study included digestibility of crude protein, calcium and phosphorus retention and phosphorus retention in grower turkey rations.

Protein Digestibility

Protein digestibility is the amount of protein that can be absorbed by livestock for metabolic processes in the body (Astungkarawati, 2014). Protein digestibility according to (Wahju, 2004) is calculated with the following formula:

$$\text{Crude protein digestibility (\%)} = \frac{protein\ consumption - PK\ excreta}{protein\ consumption}\ x\ 100\%$$

description :

protein consumption : protein level in rations x amount of consumption
protein excretion : protein excretion level x amount of excreta

Calcium and Phosphor Retention

Calcium and phosphorus retention of the mineral absorbed by livestock (Wulandari., 2012). Calcium and phosphorus retention according to (Setyaanigrum et al., 2009) can be calculated using the following formula:

Calcium Retention (g) = ∑calcium ration consumed – ∑ excreta calcium

Phosphorus retention (g) = ∑ phosphorus ration consumed – ∑ phosphorus excreta

The data obtained were analyzed by using analysis of variance with the F-table test, at a significance level of 5% to determine the effect of each treatment. If in the analysis of variance there is a treatment effect (P<0.05), then proceeded with conducting Duncan's multiple region test (Mas, 2009). Processing of data was done using the 2010 Microsoft Excel program

Results and Discussion

Based on the research that has been carried out, the result is presented in Table 3.

Table 3. Data results on Protein Digestibility, Calcium and Phosphorus Retention.

Parameter	Treatments					Average
	T0	T1	T2	T3	T4	
	----------(%)----------					
Protein Digestibility	78.65[a]	68.84[c]	56.65[d]	72.96[b]	59.96[d]	67.41
Calcium Retention	1.78[a]	0.66[c]	0.50[c]	1.12[b]	0.52[c]	0.92
Phosphorus Retention	0.91[a]	0.46[c]	0.38[c]	0.70[b]	0.39[c]	0.57

Superscripts on the same line show real difference (P<0.05).

Protein Digestion

The results of the analysis of variance showed that the T0 (control) treatment was significantly different (P <0.05) with the T1, T2, T3 and T4 treatments. The T0 treatment had higher protein digestibility than T1, T2, T3, and T4 treatments. Protein digestibility in T0 treatment is influenced by protein consumption, crude fiber content and anti-nutritional substances. Astungkarawati (2014) states that consumption of protein, ration rate, crude fiber content, and anti-nutritional substances can affect protein digestibility

The use of gamal leaf flour and cekuti leaf flour in T1, T2, T3 and T4 treatments was proven to reduce protein consumption, and the decrease in consumption was caused by the increase in crude fiber content by 11.33%, 13.82%, 11.62%, 14, 42% repectively. High fiber will reduce the appetite of turkey and increase the digestion rate. According to Wahju (2004) crude fiber consists of cellulose, hemicellulose and lignin, and in poultry the crude fiber will be bulky. Amrullah (2003) states that rations with too high crude fiber content can reduce consumption because it is voluminous and reduces

palatability. According to SNI (2006) the standard of crude fiber in duck rations is 8%, quail 7% and chickens 6%. Gamal leaves are known to have a tannin content of 1.2%. Tannins are anti-nutritional compounds that bind to proteins so that proteins cannot be digested by pepsin enzyme. According to Akmal and Mairiza (2013) Tannins are anti – nutritional compounds that form protein and tannin bonds so that they interfere with the activity of the enzyme protease.

T1, T2, T3 and T4 treatments decreased protein digestibility compared to T0 treatments, but T3 treatments had higher digestibility values compared to T1, T2, and T4 treatments by 72.96%. According to Yuniarti et al. (2015) poultry rations have high protein digestibility if their digestibility reaches 70-80%. The high digestibility value in the T3 ration is caused by th flavonoids content found in cekuti leaves. According to Khunaifi (2010) cekuti leaves contain flavonoids and polyphenols, flavonoids are polar compounds that play a role in inhibiting the growth of viruses, bacteria and fungi, thus increasing the ability of the intestine to digest rations.

Calcium Retention

The results of the analysis of variance showed that the T0 treatment was significantly different ($P < 0.05$) in T1, T2, T3, and T4. T0 ration has the highest calcium retention value. Calcium retention is strongly related to crude fiber and protein digestibility. The crude fiber content in the T1, T2, T3 and T4 treatments were 11.33%, 13.82%, 11.62% and 14.42%, respectively, resulting in a low calcium retention. According to Wulandari et al. (2012) high crude fiber can affect calcium retention, lignin content in crude fiber is very difficult to digest by poultry, so it will encourage minerals to be excreted through excreta. According to Poitillart and Gueguen (2000) crude fiber that is too high will reduce absorption of minerals in the small intestine, especially calcium and phosphorus. Calcium retention is also related to protein digestibility, the higher the protein digestibility, the higher calcium retention will be. The T0 treatment had higher digestibility of crude protein compared to T1, T2, T3 and T4 treatments. High protein digestibility increases the amount of protein substrate that binds to calcium to form Calcium Binding Protein (CaBP) bonds. Scott et al. (1982) states that CaBP bonds will carry calcium into the intestinal mucosa which will be then absorbed into the blood and circulated throughout the body. The higher the calcium absorbed, the higher the calcium retention will be.

Calcium retention in T1, T2, T3 and T4 treatments has decreased when compared with T0 treatments. However, the T3 treatment had 1.12 calcium retention higher than the T1, T2, and T4 treatment, this was caused by the high digestibility of crude protein in the T3 ration of 72.96%. According to Febrianta (2014) high protein digestibility will increase the amount of calcium deposited in the body thereby increasing calcium retention.

Phosphorus Retention

The results of the analysis of variance showed that the T0 treatment had a significant effect ($P<0.05$) on the T1, T2, T3 and T4 treatments. The highest phosphorus retention in the T0 treatment was 0.91. Phosphorus retention is influenced by the amount of phosphorus in the ration and crude fiber. The phosphorus content in the T0 treatment was 0.75% higher than the T1, T2, T3 and T4 treatments. This will increase

the consumption of phosphorus in the T0 ration, thereby increasing phosphorus retention. According Sarwono (2008) states that high consumption of phosphorus can increase the amount of phosphorus that will be absorbed and phosphorus retention will increase. The high crude fiber content in the T1, T2, T3 and T4 treatments causes the phosphorus to be wasted along with excreta, the value of phosphorus excretion is inversely proportional to the retention of phosphorus, if the excretion of phosphorus increases, the retention of phosphorus will decrease. According to Scholz-Aherns et al. (2007) calcium and phosphorus retention is the difference between the amount of minerals consumed and excreted minerals.

Phosphorus retention in T1, T2, T3 and T4 treatments decreased when compared to T0 treatments. However, the T3 treatment has a higher phosphorus retention compared to the T1, T2 and T4 treatments. This event was caused by the T3 treatment having a better balance of calcium with phosphorus than the T1, T2 and T4 treatments. According to Tillman et al. (1984) the maximum balance of calcium with phosphorus in poultry is 2: 1, a lack of calcium can cause disruption of phosphorus impregnation. Tannin content in gamal leaf T1 and T2 treatments can bind minerals such as calcium, phosphorus, Zn and Fe. According to Akmal and Mairizal (2013) states tannins can bind minerals including Zn and Fe, if available in large quantities will interfere with mineral availability.

Conclusion

Based on the results of the study it can be concluded that the giving of gamal leaf flour and cekuti leaf flour leaves reduces the digestibility of crude protein, reduces calcium and phosporus retention. The use of 5% cekuti leaves improves crude protein digestibility, improves calcium and phosporus retention than the use of 10% gamal leaves and cekuti leaves.

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