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Comparison of Nutrient Digestibility of Bligon and Kejobong Goats Fed by King Grass and Peanut Straw

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ABSTRACT

This experiment aimed to determine the nutrient digestibility of Bligon and Kejobong goats fed by king grass and peanut straw. The sample used was 6 to 8 months of five male Bligon goats, and five male Kejobong goats with the initial body weight of 15 to 20 kg and placed in separated metabolism cages. The diet and water were supplied *ad libitum*. This experiment was done in 14 days of adaptation period and seven days of the collection period. In the collection period, samples of feed, refusal feed, and feces were collected to get the chemical content includes dry matter (DM), organic matter (OM), ether extract (EE), crude fiber (CF), crude protein (CP), nitrogen-free extract (NFE), and total digestible nutrient (TDN). The data obtained were subjected to a T-test analysis. Results showed that nutrients intake, digested nutrient as well as nutrient digestibility of Bligon and Kejobong goats were not significantly different. However, Kejobong goats had EE and CP intake of 15.42% and 14.02%, digested DM, OM, and NFE of 16.29%, 15.71%, and 13.93% respectively, as well as NFE digestibility 4.37% higher than those Bligon goats ($P< 0.05$). Therefore, there was no difference in nutrient intake, digested, and digestibility of nutrients in Bligon and Kejobong goats fed by king grass and peanut straw. However, Kejobong goats appeared to have higher EE and CP intake, as well as digested and digestibility of DM, OM, and NFE than Bligon goats.

Keywords: Bligon goat, Kejobong goats, Nutrients digestibility

Introduction

Bligon is the one of goat breeds which has good fertility and productivity. In Yogyakarta, this goat population accounts for 60% from the whole goats population and takes up to 12,000 heads per year of their productivity. Kejobong goats are one of local goat breeds of Purbalingga, Central Java which has similar productivity with Bligon goats. Their population is 15,317 head in Kejobong distric, Purbalingga, Central Java (Sodiq and Haryanto, 2007). Kejobong and Bligon goats are known as local Indonesian goat breeds that have good productivity. Kejobong goat has better performances (growth, feed intake, feed efficiency, and body sizes) than Bligon goats (Budisatria *et al*., 2012). Smallholder goat production systems are mostly based on the traditional system. This situation exists in many regions of the tropics, where goats raised in traditional systems mostly roam freely in fallow land, forest, and grassland. The primary feed resources of animals are native grasses, legumes that occur naturally in grasslands, tree leaves and crop residues (Osakwe and Udeogu, 2007). In Java, feed resources for goats are king grass as native grasses and peanut straw as legumes. In the wet season, those products are high in several regions.

The nutrient requirements of goats are determined by age, sex, breed, production system (dairy or meat), body size, climate, and physiological stage. Feeding strategies should be able to meet energy, protein, mineral, and vitamin needs depending on the condition of the goats. Goats do not depend on intensive feeding systems except some supplemental feeding during growth, lactation, pregnancy, and winter (Rashid, 2008). This study was designed to evaluate nutrient intake digestibility between Bligon and Kejobong goats fed by king grass and peanut straw.

Materials and Methods

Animals

Experimental animals consisted of five Bligon and five Kejobong male goats at

approximately 6 up to 8 months of age and had an initial body weight of 18 up to 20 kg. All animals were housed in individual metabolism cages, well-ventilated, and nylon nets were fitted under the cages for fecal collection.

Diets

King grass with 49 days of age was collected and stored in a protected shed, as well as peanut straw was were collected after peanuts harvesting and stored in a protected shed. Both of feed materials were chopped as 5 cm in size. King grass and peanut straw were offered with the ration of 50:50 (w/w) based on dry matter.

Experimental procedure

This experiment was done by 14 days of adaptation and 7 days of collection periods. Clean drinking water was offered as *ad libitum*. The diets were offered twice in a day (08:00 a.m. and 03:00 p.m.) as *ad libitum.* Feed leftover were collected and weighed in the morning before fresh diet was offered for calculating feed intake. Daily feed intake was feed offered minus refusal feed.

Digestibility and feces collection

Feces were collected in nylon net, removed, and weight every 24 h during collection periods. After recording the weight, 10% proportions of the 24 hours individual feces were subsampled and stored at 5°C, then composited with other feces collected during the collection period. Then feces samples were used for later chemical analysis.

Chemical analysis

Feed, refusal, and feces samples were ground using a hammer mill through a sieve of 2mm screen diameter and analyzed for the proximate constituents including dry matter (DM), organic matter (OM), ether extract (EE), crude fiber (CF), crude protein (CP), nitrogen-free extract (NFE), and total digestible nutrient (TDN) content determined following standard methods (AOAC, 2005). Data obtained were used to calculate the nutrient intake (feed intake times to nutrients in feed), digested nutrient (nutrient intake minus nutrients in feces), as well as nutrient digestibility (nutrients in feed minus nutrients in feces divided by nutrient in feed times to 100%).

Experimental design and statistical analysis

This experiment was arranged in an independent T-test, with goat breed (Bligon and Kejobong) became the factor. Goat breed was separately conducted for each treatment with five replicates. The goat diet utilized King grass and peanut straw. The data were analyzed with T-test (Rosner, 1990).

Result and Discussion

The animals remained healthy throughout the entire period of the experiment. Table 1 presents the nutrient composition (including DM, OM, CP, CF, EE, NFE, and TDN) of the king grass and peanut straw. Whereas Table 2 and 3 show the data of nutrient intake, as well as the digested nutrient and nutrient digestibility of Bligon and Kejobong goats, respectively. The dietary treatment used in the current study were a combination of king grass and peanut straw (with ratio 50:50, w/w) in all goats with CP diet 9.52% and TDN 41.94%.

There was no significant difference in nutrient intake between Bligon and Kejobong goats ($P>0.05$) fed by king grass and peanut straw. However, EE intake per head and metabolic body weight, as well as CP intake per metabolic body weight in Kejobong goats, were higher than Bligon goats. Kejobong goats consumed EE 4.59% or 14.02% (based on metabolic body weight) and also CP 15.42% (based on metabolic body weight) were higher than those in Bligon goats ($P<0.05$). Digested and digestibility of nutrients of Bligon and Kejobong goats did not show significant differences ($P>0.05$), but several digested nutrient and nutrient digestibility of Kejobong goats were higher than those in Bligon goats. The result showed that digested NFE of Kejobong goats was 4.81% higher than in Bligon goats ($P<0.05$), also digested DM, OM and NFE (based on metabolic body weight) of Kejobong goats were 16.29%, 15.71%, and 13.93%, respectively, higher than Bligon goats ($P<0.05$). Kejobong goats also showed NFE digestibility 4.37% higher than Bligon goats ($P<0.05$). Therefore, the result indicates that the incorporation of king grass and peanuts straw in the diets of the goats did not prove any adverse effect on digestibility. All the experimental animals had adequate total DM intake, which was ranged from 668.03 to 679.37 g/head/day, CP intake 66.78 to 70.74 g/head/day, and TDN intake 306.96 to 309.97 g/head/day. Goats weight 20 kg required daily intake of DM, CP, and TDN as much as 600 g, 46 g, and 334 g, respectively (NRC, 1981). Nutrient intake of Kejobong and Bligon goats already met their basic requirements.

Table 1. Nutrient composition of king grass and peanuts straw (% DM)

Nutrient composition	Kind of diets	
	King grass	Peanut straw
Dry matter	23.03	31.08
Organic matter	86.57	87.42
Crude protein	5.82	13.22
Crude fiber	33.29	20.88
Ether extract	0.47	3.72
NFE	46.98	41.06
TDN	51.84	41.94

Table 2. Mean and deviation standard of nutrient intake of Bligon and Kejobong goats fed by king grass and peanuts straw

Variables measured	Goats breed	
	Bligon	Kejobong
Nutrient intake (g/head/d)		
Dry matter^{ns}	668.03 ± 34.18	679.37 ± 14.29
Organic matter^{ns}	586.12 ± 27.80	595.81 ± 11.77
Crude protein^{ns}	66.78 ± 4.92	70.74 ± 1.70
Crude fiber ^{ns}	169.85 ± 10.50	173.63 ± 11.43
Ether extract*	15.47 ± 0.58^{a}	16.18 ± 0.27^{b}
NFE ^{ns}	334.04 ± 12.71	335.26 ± 5.93
TDN^{ns}	306.96 ± 16.82	309.97 ± 5.93
Nutrient intake (g/W$^{0.75}$/d)		
Dry matter^{ns}	70.82 ± 2.91	78.37 ± 7.65
Organic matter^{ns}	62.14 ± 2.37	68.74 ± 6.72
Crude protein*	7.07 ±0.36^{a}	8.16 ±0.79^{b}
Crude fiber ^{ns}	18.01 ± 0.95	20.03 ± 2.27
Ether extract*	1.64 ±0.04^{a}	1.87 ±0.18^{b}
NFE ^{ns}	35.42 ± 1.23	38.68 ± 3.68
TDN^{ns}	32.54 ± 1.42	35.77 ± 3.60

^{ns} not significantly different
* (P<0.05).

Table 3. Mean and deviation standard of digested nutrient and nutrient digestibility of Bligon and Kejobong goats fed king grass and peanuts straw

Variables measured	Goats breed	
	Bligon	Kejobong
Digested nutrient (g/head/d)		
Dry matter^{ns}	472.97 ± 29.69	505.89 ± 43.47
Organic matter^{ns}	434.26 ± 22.85	461.96 ± 33.90
Crude protein^{ns}	45.89 ± 5.18	48.96 ± 8.14
Crude fiber^{ns}	115.31 ± 10.00	125.80 ± 20.70
Ether extract^{ns}	11.05 ± 1.06	12.58 ± 1.67
NFE*	262.02 ± 7.04^{a}	274.62± 7.91^{b}
Digested nutrient (g/ W$^{0.75}$/d)		
Dry matter*	50.14 ±2.59^{a}	58.31 ±7.05^{b}
Organic matter*	46.03 ±1.77^{a}	53.26 ±6.28^{b}
Crude protein^{ns}	4.86 ± 0.46	5.65 ± 1.11
Crude fiber^{ns}	12.21 ± 0.82	14.49 ± 2.57
Ether extract^{ns}	1.17 ± 0.09	1.45 ± 0.27
NFE*	27.79 ±0.80^{a}	31.66 ±2.94^{b}
Nutrient digestibility (%)		
Dry matter^{ns}	70.82 ± 3.16	74.39 ± 4.95
Organic matter^{ns}	74.11 ± 2.70	77.47 ± 4.28
Crude protein^{ns}	68.60 ± 3.94	69.08 ±10.64
Crude fiber^{ns}	67.88 ± 4.10	72.10 ± 7.57
Ether extract^{ns}	71.37 ± 5.45	77.65 ± 9.19
NFE*	78.49 ± 2.23^{a}	81.92 ± 2.17^{b}

^{ns} not significantly different
* (P<0.05).

Latifah *et al.* (2019) reported that DM, OM, CP, EE, CF, NFE, and TDN intake of Bligon goats fed by combination of king grass, Calliandra and protein supplement were 78.41, 69.23, 13.72, 3.75, 11.94, 50.22, and 61.52 g/ $W^{0.75}$/d, respectively.

These values were comparable to West African Dwarf (WAD) goats fed by concentrate contained various levels of *Moringa oleifera* leaf meal had DMI 336.39 to 392.46 g/head/d (Tona *et al*., 2014), while DMI of WAD goats fed by maize stover and supplemented with *Acacia tortilis* or *Balanites aegyptiaca* leaf browses was 294 to 449 g/head/d (Ondiek *et al*., 2013). This comparable of DMI due to the bodyweight of Bligon and Kejobong goats (15 to 20 kg) was heavier than WAD (7.5 to 12 kg). Even though DMI of Bligon and Kejobong goats fed by king grass and peanuts were higher than WAD goats, their nutrient digestibility was lower than WAD goats fed by diets containing sweet orange peel meal as reported by Oloche *et al*. (2013), and was higher than WAD fed by diets containing maize stover (Ondiek *et al.*, 2013). Feed intake and digestibility of goats were influenced by breed and diet. According to Rashid (2008), the nutrient requirements of goats are determined by age, sex, breed, production system (dairy or meat), body size, climate, and physiological stage. Putra *et al*. (2016) showed that the microbial protein synthesis efficiency of Kejobong goats was higher than Bligon goats. This is similar to this result study that several nutrient digestibility of Kejobong goats were better than Bligon goats. Futher more, microbial protein synthesis influenced ruminal digestibility, but it need further study about rumen microbial diversity. Kejobong goats had better performances (growth, feed intake, feed efficiency, and body sizes) than Bligon goats (Budisatria *et al*., 2012).

Conclusions

In conclusion, there is no difference in nutrient intake, digested, and digestibility of nutrients in Bligon and Kejobong goats fed by king grass and peanut straw. However, Kejobong goats appear to show EE and CP intake, as well as digested and digestibility of DM, OM, and NFE higher than Bligon goats.

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