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Digestibility and Nitrogen Balance of Male Bligon and Kejobong Goat Fed Peanuts Straw

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OBJECTIVE
Bligon and Kejobong are Indonesian local goat breeds which are highly potential to be developed due to their good performances. The problem commonly arise in goat fattening is feed supply which is less than the requirement as it is depends on season. Therefore, the study on alternative feed stuffs that can fulfill the needs of the animal, for instance nutrient contents and its quality as well as its availability in area of goat reared is needed. One of the potential feedstuff for goat was agriculture by products such as peanut straw which is easy to find during harvesting time. Usually farmers use agriculture by products such as peanut straw as sole diet for ruminant. The question is that the diet can fulfill N requirement of the ruminants. Ruminant require protein in the diet to supply N for rumen microbes activity and for animal tissue metabolism. Microbial requirement are met at 6-8% crude protein in the diet while animal requirement range from 7-20% in the diet depending upon species, sex, and physiological status (Huston, and Pinchak, 2016)
Measurement of Nitrogen (N) balance is a useful and accurate method to evaluate the nutrient quality of feedstuff, especially the values of nitrogen to ruminants. The method were used to evaluate the multipurpose trees which may suitable for feed supplements (Jetana et al. 2010), to evaluate the effect of physical treatments of feedstuff on N utilization (Mbewe, et al. 2014). The method also used to evaluate the response of different species (Yusiati et al., 2000) and different breed (Elamin, et al., 2012, Yusiati et al., 2015) of ruminants to feedstuff or diets offered in order to increase efficiency of livestock production.
Based on the review, it is necessary to evaluate a single feed from peanuts straw to supply protein requirement of goats, either Bligon or Kejobong, using nitrogen balance experiment.

MATERIALS AND METHODS
Peanut crop straw obtained from the same area in the Yogyakarta province were used in this experiment as sole diet. It was served without the empty root. The hard woody straw also was throw away, and only the edible portion which were used as the feedstuff. The chopped straw was served in fresh condition, one day after harvesting.
Six male Bligon and six male Kejobong goats, age 11 month and average body weight 18 kg were used in this experiment to evaluate the effect of peanut straw as a sole diet on N retained in their body. Animal were put in the individual metabolism cages, to get good separation of the urine and feces. The feeding trial was run for couple month including one week collection period. All animals were weighed before and after the trial. The diets and drinking water were served twice a day at 09.00 am and 16.00 pm.
During the collection period, 200 g of daily feed offered samples were collected. Uneaten feed were also collected daily, early in the morning before feeding time and then were weighed. Individually, 20% of the uneaten feed samples were taken. After drying at 55°C, the samples were bulked and ground in a hammer mill to pass a 1mm screen diameter and then sub samples were taken out for nutrient analysis. Individual feces samples as much as 10% of total excretion were taken out at the end of each 24 hours period, put in poly bag and kept in fridge through the collection period. The samples were made into individual composite and got sub samples for the same analysis as the feed samples.
Urine was collected daily into plastic bucket placed under the cages and containing 10% sulfuric acid solution to reached the urine pH below 3 to avoid microbial growth. Urine volumes were measured and filtered through the 2 layers of gauze. Daily samples were taken, put into 20 ml plastic vials and brought to the laboratory for analysis.

Laboratory analysis
Representative samples of feed, refusal feed and feces were subjected to proximate analysis including dry matter and, organic matter determination following the AOAC procedure (1984), as well as crude protein by the Kjeldahl method, ether extract by Soxhlet and crude fiber by . Nitrogen content of the urine samples were also measured by Kjeldahl method. All analysis was done in duplicate.
The data obtained were used to calculate the values of Nutrient digestibility. Nitrogen balance was calculated as the amount of average daily nitrogen intake which is not excreted in feces and urine (g/day).

**Statistical analysis**
All data collected were subjected to statistical analysis of compared means by independent samples T-Test design.

**RESULT AND DISCUSSION**

**Nutrient intake and Digestibility Coefficient**
Nutrient contents of peanut straw was dry matter (DM) 20.13%, organic matter (OM) 87.39%, crude protein (CP) 17.62%, ether extract (EE) 3.88%, crude fiber (CF) 30.57%, and nitrogen free extract (NFE) 35.32%.

It showed in Table 1 there were no significant differences in the nutrient intake of Bligon goat compared with those of Kejobong goat whether the values presented in g/day or in g/W0.75/day. Dry matter intake of Bligon and Kejobong goat were 2.59% and 3.08% of their live weight, which were enough for maintenance need as mentioned it should be 2.4% of animal live weight (NRC, 1981). Bligon goats with 20kg live weight, fed by diet consisted of 65% King Grass, 15% soybean meal and 20% rice bran supplemented with 3% protected crude palm oil (DM bases) showed the DM and OM intake were 642 ± 22 gram/d and 554.77 ± 17 gram/d (Yusiat et al., 2015). Lower intake in this recent finding compared with the previous finding due to the different component of the diet.

Nutrient digestibility coefficient of the peanut straw in Bligon and Kejobong goat, were shown in Table 2. Nutrient digestibility, included DM, OM, CP, EE, CF and NFE digestibility were significantly higher in Bligon goat compared with ones in Kejobong goat.

Nutrient rumen digestibility was related to the rumen microbial activity. Digestibility of the diet can be different among the breeds as the digestive processes were directed by enzyme activities of the rumen microbes as well as the host enzyme activities which are species specific. It was not expected that the nutrient digestibility coefficient of the diet in Bligon goat higher than in Kejobong goat. Estu et al. (2015) reported that total excretion of PD in Bligon goat were 114.14 µmol/W0.75/hari, with microbial protein synthesis efficiency reach out 4.61 g N/kg degraded of organic matter in rumen (DOMR), while in Kejobong goat were 180.18 µmol/W0.75/hari, with microbial protein synthesis efficiency 6.90 g N/kg DOMR when the animal received the peanut straw as sole diet. It is also reported that efficiency of protein microbial synthesis was higher in Kejobong when the goat received diet containing King grass and peanut straw (Yusiat and Hanim, 2013). It seemed that the higher digestibility of peanut straw in Bligon goat was not only as an effect of higher rumen microbial enzyme activities, but also as the effect of the digestive enzyme activities of the host. It needs to be evaluated in the future.

This recent study found that crude protein intake of Bligon and Kejobong goat, less than 100g/day. It was lower than the goat requirement. Lamb with 20kg live weight need crude protein 112g/day to have 100g daily body weight gain (NRC, 1985).

**Nitrogen intake, fecal and urinary N Excretion and N balance.**
The result of N balance study was presented in Table 3. It was shown there were not significant differences of N consumption, N feces excretion, and N urinary excretion between Bligon and Kejobong goat. When the values were presented in metabolic body weight unit, N intake, fecal N and urinary N of Bligon goat were 1.62 ± 0.11, 0.33 ± 0.05 and 0.11 ± 0.04 g/W0.75/d, while Kejobong goat were 1.85 ± 0.20, 0.44 ± 0.06 and 0.20 ± 0.12 g/W0.75/d. The N intake and fecal N excretion were not also significantly affected by the breed, but the urinary N excretion in Bligon goat tended lower than that in Kejobong goat when expressed in g/W0.75/d unit. The N absorbed of Bligon goat was not significantly differ from Kejobong goat. When it was expressed in percentage of N intake, N absorbed in Bligon goat was significantly higher compared with that in Kejobong goat (Table 3).

The nitrogen content of Bligon feces in this study amounted to 2.04%, while Kejobong of 2.01% (DM basis). The N retained was higher in Bligon than Kejobong goat (P ≤ 0.05) when expressed in g/day unit as well as in percentage of N intake unit.

Urinary N excretion (g/ head/day) of Kejobong tend to be higher than Bligon goat. This may be due to differences of protein metabolism in the both breeds. Based on study, it was known that the N retained in both breeds were positive. This indicated that nitrogen balance was also positive, means there were N retained in the body which used for basic living and production.
The present study was not in line with El-Meccawi et al. (2009), who reported that feeding wheat straw as a single feed for Local-cross goats gave negative gave nitrogen balance in a negative position. It means that wheat straw as a single feed can not supply the protein requirements of livestock. Paengkoum and Paengkoum (2009) reported that Boer-cross receiving complete diets from rice straw got 5.6 g/head/day N retention, supported by average daily weight gain of 59.5 g/head/day. This means, complete diets from rice straw can supply protein requirement of the goats.

In this study, positive nitrogen balance supported by the positive daily gain weight. The N retention value of Bligon goat was 11.33 g/head/day which gave 87.30 g/head/day of daily gain weight, while N retention of Kejobong goat was 10.08 g/head/day with 91.27 g/head/day of daily gain weight. The result showed that the both breeds can use peanut straw as a sole diet.

CONCLUSION

Male Bligon and Kejobong goat received the peanut straw diet, showed the positive N balance, therefore peanut straw can be used as a sole diet in the both goats. Bligon goat more efficient in using Nitrogen compared with Kejobong when they received peanut straw as sole diet.

KEYWORD: Bligon goat, Kejobong goat, Peanut straw, Nitrogen balance

Table 1. Nutrient intake of Bligon and Kejobong goat fed by peanut straw as sole diet (mean ±SE)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Intake (g/day or g/W0.75/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bligon goat</td>
</tr>
<tr>
<td>Dry matter ns</td>
<td>525.36 ± 26.20 (55.01±3.99)</td>
</tr>
<tr>
<td>Organic matter ns</td>
<td>464.34 ± 22.10 (48.61±3.37)</td>
</tr>
<tr>
<td>Crude Protein ns</td>
<td>96.72 ± 3.77 (10.13±0.66)</td>
</tr>
<tr>
<td>Ether Extract ns</td>
<td>20.20 ± 1.17 (2.1±1±0.17)</td>
</tr>
<tr>
<td>Crude Fiber ns</td>
<td>160.11 ± 8.66 (16.77±1.41)</td>
</tr>
<tr>
<td>N Free Extract ns</td>
<td>187.31 ± 10.24 (19.60±1.25)</td>
</tr>
</tbody>
</table>

ns. not significant

Table 2. Nutrient digestibility coefficient of Bligon and Kejobong goat fed by peanut straw as a sole diet (mean ± SE1).

<table>
<thead>
<tr>
<th>Nutrient digestibility (%)</th>
<th>Bligon goat</th>
<th>Kejobong goat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter</td>
<td>70.77 ± 1.72 b</td>
<td>64.65 ± 1.58 a</td>
</tr>
<tr>
<td>Organic matter</td>
<td>75.68 ± 1.72 b</td>
<td>69.07 ± 1.62 a</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>79.90 ± 1.20 b</td>
<td>76.15 ± 1.22 a</td>
</tr>
<tr>
<td>Ether Extract</td>
<td>55.71 ± 4.27 b</td>
<td>45.43 ± 4.86 a</td>
</tr>
<tr>
<td>Crude Fiber</td>
<td>72.95 ± 1.59 b</td>
<td>65.89 ± 2.25 a</td>
</tr>
<tr>
<td>N Free Extract</td>
<td>77.94 ± 2.55 b</td>
<td>70.71 ± 1.77 a</td>
</tr>
</tbody>
</table>

1 Standard Error of the Mean.

ab, The means with different superscripts at the same row differ significantly (P<0.05).
Table 3. Nitrogen intake, fecal nitrogen, urinary nitrogen, digested nitrogen, N balance of Bligon and Kejobong goat fed by peanut straw as sole diet.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Bligon goat</th>
<th>Kejobong goat</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Intake (g/day) <strong>ns</strong></td>
<td>15.48 ± 0.61</td>
<td>15.42 ± 0.61</td>
</tr>
<tr>
<td>Fecal N excretion (g/day) <strong>ns</strong></td>
<td>3.12 ± 0.50</td>
<td>3.69 ± 0.56</td>
</tr>
<tr>
<td>Urinary N excretion (g/day) <strong>ns</strong></td>
<td>1.04 ± 0.41</td>
<td>1.66 ± 0.90</td>
</tr>
<tr>
<td>Absorbed N (g/day) <strong>ns</strong></td>
<td>12.36 ± 0.57</td>
<td>11.74 ± 0.37</td>
</tr>
<tr>
<td>Retained N (g/day)</td>
<td>11.33 ± 0.65&lt;sup&gt;b&lt;/sup&gt;</td>
<td>10.08 ± 0.99&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Absorbed N (% N intake)</td>
<td>79.89 ± 1.20&lt;sup&gt;b&lt;/sup&gt;</td>
<td>76.14 ± 1.23&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Retained (%N intake)</td>
<td>73.15 ± 0.95&lt;sup&gt;b&lt;/sup&gt;</td>
<td>65.33 ± 2.42&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Retained (% absorbed N)</td>
<td>91.62 ± 1.36</td>
<td>85.84 ± 3.11</td>
</tr>
</tbody>
</table>

**ns** non significant

<sup>ab</sup> Mean within the same row with different superscript letters differ significantly (P<0.05)

REFERENCES


CERTIFICATE OF PRESENTATION

This is to certify that

Prof. Lies Mira Yusiati
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has contributed as a chairperson at the 17th Asia-Australasian Association of Animal Production Society Animal Science Congress held in Fukuoka, Japan from 22 to 25 August 2016

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