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Comparison of N excretion between Goat and Sheep

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Abstract. This study was aimed to evaluate N excretion between goat and sheep. This study used the data of 30 male Kacang goats (BW 8.3 – 23.8 kg) and 30 male thin tailed sheep (BW 20.7 – 28.5kg) from 6 experiments. The diets contained 9–18% CP and 55–78% TDN. Parameters observed were N intake (NI) and N feces of goat (NFG), N feces of sheep (NFS) N urine of goat (NUG), N urine of sheep (NUS) and N excreted total for goats (NETG) and sheep (NETS). All data were analyzed using correlation regression analysis. The data showed that NI was correlated with NUS ($r=0.478$), NFS ($r=0.709$) as well as NETS ($r=0.732$), all were belong to sheep stronger than of goats (NUG $r=0.311$; NFG $r=0.334$ and NETG $r=0.157$). Based on the results, it can be concluded that sheep and goat has a different ability to utilize the N intake, and therefore the goats and sheep could not be predicted using single prediction estimation and suggested to be provided by specific prediction equation.

1. Introduction

Since the concern on environmentally issues has emphasized in the last decades, livestock feeding has not only targeted mere on production, but also considering on controlling emissions of nitrogen and methane gas that have the potential as greenhouse gases. The calculation of the output of greenhouse gas emissions is also more detailed and accurate, changing from an animal population-based calculation in Tier 1 to the calculation based on animal categories, levels of production as well as animal population in Tier 2 and 3 [1].

Regarding on the use N-containing feed resources efficiently, it is important to fulfill the requirement of N for maintenance of animal body and its production. However, in practical operation, the animals need of N source of feed are very easy to change in relation to their growth rates, changes in physiological status, and production levels cause changes in their N utilization and also the amount of N wasted. The simplest method to determine the N utilized and N wasted by animal is by using a sufficient data on the N content of feces (FN) and urine (UN) to assess the portion of N excreted by ruminants.

Previous studies reported that sheep and goats are similar ability to digest high quality forage [2, 3], but goats were reported better than sheep to utilize low quality forages [3, 4]. The differences between N utilization in goats and sheep was also reported that the N intake influenced fecal N in goats but not in sheep, but the influence of N intake on urinary N in goats and in sheep was not found [5]. Based on the considerations above, and for anticipation to provide a specific default value for each breed in the future, therefore this study was aimed to evaluate on whether there was a difference between goat and sheep, or to determine the correction factors between them.



2. Materials and methods

Data from 30 male Kacang goats and 30 male thin tailed sheep from 6 experiments studying various feeding regimes on N utilization were used in this study. All the animals were at 10 -16 months old, with the body weight of goats and sheep were ranged at 8.3 – 23.8 kg and 20.7 – 28.5 kg, respectively. All the animals were adapted for the feeding experiment at least 1 month prior to be fed the experiment diets.

The diets were formulated to contain 9–18% CP and 55–75% TDN to fulfill the requirement of daily body maintenance and production. Parameters observed were N intake and N feces of goat (NFG), N feces of sheep (NFS), N urine of goat (NUG), N urine of sheep (NUS). The N utilizations were measured using 7 days total collections. The samples of feed, urine and feces were analysis for determining N by Kjeldahl methods. The N intake was calculated by multiplying N content in feeds and feed intake. The fecal N and urinary N was calculated by multiplying N content in feces and in urine to the amount of feces and urine excreted, respectively. The data were analyzed using correlation analysis.

Table 1. Data of N intake and excreted in the sheep and goats used in this study

	Goats (n=30)		Sheep (n=30)	
	Range	Average \pm sd	Range	Average \pm sd
Body weight, kg	8.3 – 23.8	14.8 \pm 3.67	20.7 – 28.5	24.9 \pm 2.67
Metab. BW, kg ^{0.75}	0.87 – 1.91	1.34 \pm 0.25	1.98 – 2.31	2.10 \pm 0.15
N intake, g/d	5.60 - 18.40	10.30 \pm 3.44	20.74 – 28.52	24.92 \pm 2.67
N Excreted, g/d	2.18 – 6.25	3.82 \pm 1.24	3.52 – 7.74	5.14 \pm 1.11
N urine, g/d	0.49 – 3.01	1.43 \pm 0.62	1.46 – 5.38	2.95 \pm 1.08
N feces, g/d	1.39 – 3.81	2.41 \pm 0.80	1.97 – 2.41	2.19 \pm 0.15

3. Results and discussion

The data used in this study are presented in table 1. The N intake and N excreted in goats were lower than of sheep due the body weight of experimental animal used in this study. The body weight of sheep was higher than of goats (24.9 vs 14.8 kg). In general, the effect of body weight was also found in amount of N intake and the total N excreted (in form of feces and urine) which sheep was higher than of goat (5.14 vs 3.82 g), but if calculated in percentage of intake, the average of N excreted (in form of feces and urine) in goat was higher than in sheep, being 37.1 and 20.6%, respectively. If comparison was done based on metabolic body weight (MBW), the goats excreted total N higher than of sheep (2.85 vs 2.45 g N per kg MBW) as well as N feces (1.80 vs 1.04 g N/kg MBW), but goats excreted N smaller than of sheep through urine (1.07 vs 1.40 g N/kg MBW).

The higher excretion on goats could be explained by the differences on physiological characteristics that goats has a better than sheep to utilize low quality forages [3, 4]. Correlation between N intake and N excreted through feces and urine in goats and sheep is presented in figure 1. All regression showed that increasing N intake resulted in increasing N excreted through feces as well as urine except in N feces of goat (NFG). For NFG, increasing N intake give decreasing N excreted through feces (NFG), and this contributed to the total value of N excreted in sheep and goat (NETG).

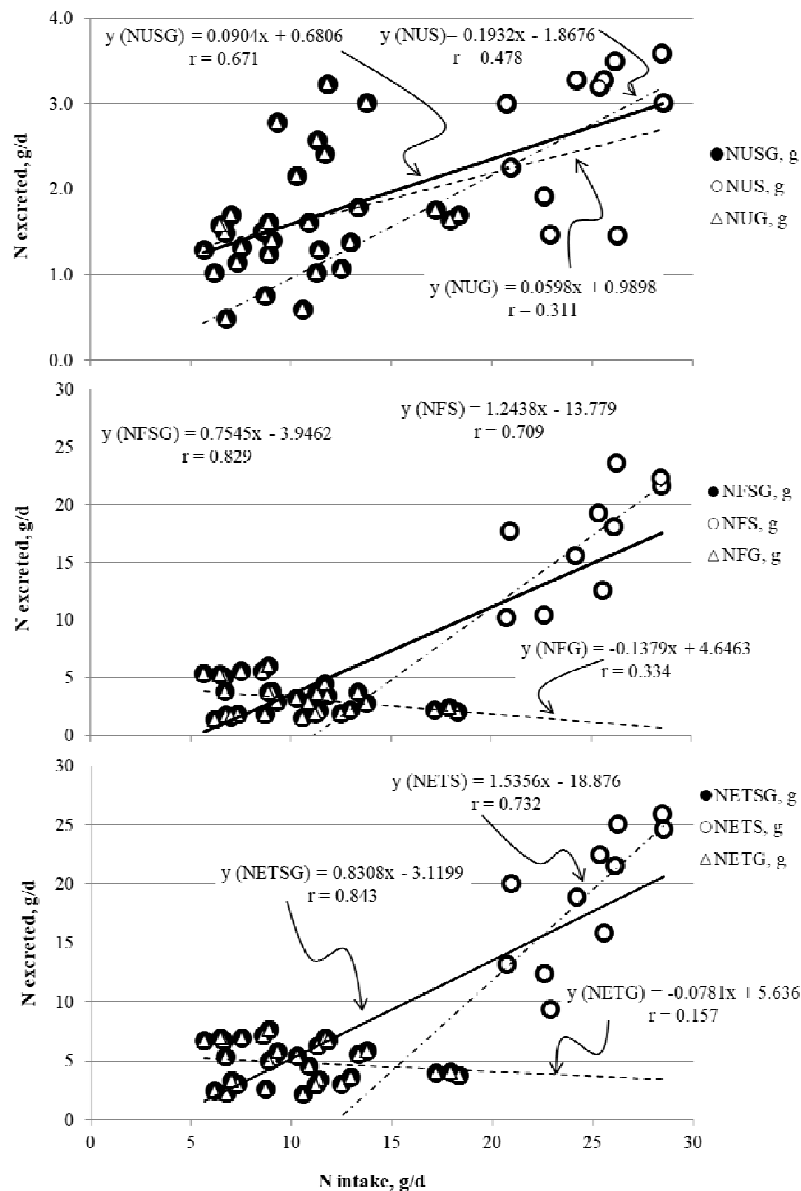


Figure 1. Correlation between N intake (g/d) and total N excreted (g/d), as well as through feces and urine in goats and sheep. NUSG is N urine in sheep and goats were correlated together, NUS is N urine in sheep, NUG is N urine in goat; NFSG is N feces in sheep and goat, NFS is N feces in sheep, NFG is N feces in goats; NETSG is N excreted total in sheep and goat, NETS is N excreted total in sheep, NETG is N excreted total in goat.

This phenomenon is different from other findings that increasing N intake will give increasing N excretion. Increasing in N excreted through feces indicating the digestion process related to the conditions of digestion tract, rumen microbes and others such as ambient temperature that may stimulate the passage rate of feed. The contradictory results of NFG and NFS could be explained by the goats has a shorter retention time in rumen than in sheep [6], so sheep utilized the feeds better than of goats due to they have more time to digest the feed, including N compounds. Moreover, goat and sheep have also contradictory concerning the rumen fermentation pattern, although observed

differences were of minor importance [6]. The ammonia-N content in the rumen liquor of goats was greater than in sheep and accounted for a rather fixed proportion of the total-N fraction in contrast with the wide range of values found in sheep [7]. But, the difference between goats and sheep on ammonia-N that should be appeared in urinary N, in this study was not confirmed.

4. Conclusion

The different correlation of N intake and N excreted in goats and sheep, especially in N excreted through feces concluded that sheep and goat could not be grouped as one, and predicted using single prediction equation, but must be provided by their specific prediction equations.

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