TECHNICAL SESSION II

Effect of feeding regime on growth, digestibility and excretion of purine derivatives in goats.

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Abstract
A study was conducted to examine the effect of two dietary regimes on the growth, nutrient digestibility and excretion of urinary purine derivatives of cross-bred (nondescriptive x Jamnapari) goats. Fifteen goats (approx 1.5 years old, average body weight 22 ± 1 kg) were fed with an "on farm diet" consisting of conventional leaves and coconut poonac for 30 days (27% dry matter, 11.5% crude protein). Thereafter an "experimental ration" (50% conventional leaves + 30% Guinea grass + 20% coconut poonac & sesame oil meal + mineral mixture) was fed for another 30 days. Feed intake (0.8 ± 0.14 to 1.0 ± 0.3 kg/head/day), weight gain (0.33 ± 0.21 to 0.66 ± 0.50 kg/head/day) and dry matter digestibility (50.3 ± 0.56 to 56.8 ± 0.43) increased significantly when the "experimental diet" was fed as compared with the "on farm diet". Similarly, animals had a higher (P<0.05) excretion of allantoin and thereby a higher (P<0.05) excretion rate of total purine derivatives (PD) when fed with the experimental ration. Allantoin from the total PD accounted for more than 75% while xanthine, hypoxanthine and uric acid accounted for 25% for both diets. The endogenous mean PD excretion rates ranged from 1.80 and 3.62 mmol/day for "on farm" and "experiemental" diets respectively, which are considered directly related to the ruminal microbial nitrogen production.
The results revealed that excretion of purine derivatives of goats are comparable to that of cattle and sheep. It is important to develop feeding strategies monitored by this technique using locally available feeds, to enhance the performance of goats.
Key words: goats, growth, digestibility, urinary purine derivatives, allantoin, xanthine, hypoxanthine.

Introduction

More than 70% of goats in Sri Lanka are local and non-descriptive types and mainly reared for meat production. Goats are hardy and prolific animals thriving well in conditions where other livestock cannot survive. The goat has become an important animal in rural agriculture in Sri Lanka, because rearing of goats provides a small but nevertheless significant supply of animal protein in the form of milk and meat. Goat meat is expensive and popular and can be utilized to satisfy the increasing demand for animal protein. The milk itself can form the basis for a range of products as well. Goats can consume a wide range of plant material and thrive under harsh conditions, cost less to keep and compete well with its traditional rival, the dairy cow. However, there have been no reports in Sri Lanka about the purine metabolism and PD excretion of local crossbred goats. Therefore, the objective of this study was to evaluate the applicability of the purine derivative (PD) method for crossbred goats. At the same time, the effect of digestibility on feed intake, weight gain, and the excretion of purine derivatives of goats were evaluated under two feeding regimes ("on farm" and "experimental" rations).

Materials and methods

Animals and diets

Fifteen crossbred (nondescriptive x Jamnapari) goats (approx. 1.5 years old, body weight 22 ± 1 kg) were fed "on farm diet" consisting of conventional leaves (80%) and

concentrates (20% coconut poonac) for 30 days. Diet per animal consisted of 27% DM and 11.5% CP. Thereafter an experimental ration was formulated and fed for another 30 days (30.3% DM, 15.5% CP). The diet per animal consisted of 50% conventional leaves, 30% guinea grass, 20% concentrates (coconut poonac-21% CP + sesame oil meal-40% CP) and 50 g of mineral mixture. The experimental design was a randomized complete block design (2 treatments with 15 replicates). Live weights of animals were recorded at the beginning at 15 days and at the end of each feeding period.

Measurements and sample collection

During the last five days of each experimental period, samples of feed offered and feed refused were collected. Dung was totally collected daily during the five day period. Fresh weights of dung were taken and 1% sub samples were stored for analyses. Urine samples were collected during the last 2 days of each feeding period. Spot urine samples were collected between 08-12 hrs, 12-16 hrs, 16-20 hrs and 20-08 hrs each day. Sub samples were diluted and stored at -4°C. The urine was analysed for total N (Kjeldhal method) while creatinine and purine derivatives (allantoin, xanthine, hypoxanthine and uric acid) were determined following the procedures of IAEA TECDOC 945 (1997).

Statistical analysis

Statistical analysis of the experimental data was done using the soft ware packages EXCEL 2005 and SAS system V 8.1.

Results and discussion

Table 1. Weight gain, feed & crude protein intake and nutrient digestibility of crossbred goats fed with the on farm and experimental rations.

Ration	*Dry matter intake (kg/head/day)*	*Crude protein intake (kg/head/day)*	*Dry matter Digestibility (%)*	*Weight gain (kg/head/day)*
On farm ration	0.8± 0.14	0.09± 0.01	50.3 ±0.56	0.33±0.21
Experimental ration	1.0± 0.30	0.16± 0.05	56.8±0.43	0.66±0.50

Weight gain, feed intake and nutrient digestibility of crossbred goats fed with the two different diets ("on farm" and "experimental rations") are presented in Table 1. Dry matter intake increased ($P<0.05$) from 0.8 to 1.0 kg/head/day when the experimental ration was fed as compared to the on farm diet. Similarly, higher dry matter and crude protein intake of goats was due to increased dry matter digestibility of the "experimental ration" as compared to "on farm ration". Better weight gain was also associated with higher dry matter intake and better dry matter digestibility of the experimental ration as well. The reported dry matter digestibilities in this study were higher than those reported previously under Sri Lankan conditions presumably due to feeding of grass and mineral mixture in addition to conventional leaves.

PD excretion in spot urine samples collected from cross bred goats

Ranges and daily patterns of PD, CR and PD/CR ratios in urine samples of cross bred goats are presented in Table 2. The mean excretions of allantoin ranged from 1.145 to 2.834 for "on farm" and "experimental" diets, respectively. The amounts of xanthine, hypoxanthine and uric acid were 0.155 to 0.22, 0.333 to 0.452 and 0.167 to 0.176 mmol /day for 'on farm' and for 'experimental rations', respectively. It was also observed that there was no regular pattern or diurnal variation in allantoin, uric acid, xanthine, hypoxanthine or creatinine concentrations due to different times of sampling. However, there was a variation associated with the different feeding regimes. An increase in the

mean concentrations of allantoin and total PD were observed when fed with the "experimental ration" as compared with the "on farm" ration. These findings are consistent with the work of other authors (Nsahlai et al., 2000; Chen & Gomez, 1995) and also with our previous work done with local cattle and cross bred milking cows (Seresinhe et al., 2004). In contrast to the observations with milking cows and cattle, creatinine excretion of local goats was positively affected by the feeding regime. Nevertheless, the proportion of uric acid in total PD was also lower than that observed with local cattle. The PD/CR ratios were within the ranges of 19.19 to 22.28% and were neither affected by dietary treatment nor time of sampling. Our findings in this study are consistent with those reported by numerous workers in that the efficiency of microbial protein synthesis as measured by urinary PD responded strongly to dry matter and CP intake (Puchala and Kulasek, 1992; Osuji *et al.*, 1993; Dapoza *et al.*, 1990). Therefore, it can be suggested that, spot urine sampling appeared to be a satisfactory method to estimate the purine derivative excretion of goats.

TABLE 2. Daily patterns of PD and creatinine excretion in the urine of crossbred goats

Sampling time	*Allantoin mmol/l*	*Uric acid mmol/l*	*Xanthine mmol/l*	*Hypoxanthine mmol/l*	*Total PD mmol/l*	*Creatinine mmol/l*	*PD: CR Ratio*
On Farm Diet							
8-12 hrs	1.258	0.168	0.120	0.302	1.848	1.350	20
12-16 hrs	1.001	0.164	0.150	0.360	1.675	1.220	19
16-20 hrs	1.313	0.171	0.200	0.310	1.994	1.520	19
20-24 hrs	1.008	0.166	0.150	0.360	1.684	1.110	19
MEAN	**1.145**	**0.167**	**0.155**	**0.333**	**1.800**	**1.300**	**19**
Experimental Diet							
8-12 hrs	2.910	0.162	0.230	0.464	3.766	2.590	22
12-16 hrs	2.837	0.161	0.220	0.452	3.690	2.443	23
16-20 hrs	2.739	0.161	0.210	0.438	3.570	2.509	21
20-24 hrs	2.650	0.158	0.220	0.456	3.504	2.373	23
MEAN	**2.834**	**0.176**	**0.220**	**0.452**	**3.617**	**2.998**	**22**
CV%	**7.22**	**3.42**	**6.48**	**4.35**	**6.75**	**6.34**	**6.43**
Level of Sig.							
Diet	**0.05**	**NS**	**NS**	**0.05**	**0.05**	**0.05**	**NS**
Time	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

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