

Apparent digestibility and nitrogen balance in goats given different levels of crushed whole soya beans

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Introduction

Efficiency of utilization of crude fat (ether extract) in ruminant diets is controversial (Van der Honing and Tamminga, 1986; Zinn, 1989).

Interactions between fat and other nutrients in the gastrointestinal tract may affect not only fat utilization but also digestion of other nutrients, especially crude fibre (Borgstrom, 1974 and Kadzere and Molnar, 1989). The objective of this study was to evaluate the effects of level of inclusion of crushed raw whole soya beans in goat diets on apparent digestibility of crude nutrients and nitrogen balance.

Material and methods

Sixteen growing castrated male indigenous goats (20 months old, average live weight 17 ± 4.5 kg) were divided into four groups of four goats each, and given diets based on Katambora Rhodes grass (*Chloris gayana*) and maize containing either 0, 150, 300 or 450 g/kg crushed whole soya beans (diets 1, 2, 3 and 4 (Table 1), respectively) for 30 days divided into 23-day adjustment and 7-day collection periods.

Two days before putting the animals in individual metabolism cages, goats were treated for internal parasites.

At each feeding time, 08.00 and 15.00 h, 200 g of the respective diet, and 175 g ground Katambora Rhodes grass hay were added to the feeding trough of each goat. Goats had free access to water throughout the experiment. Apparent nutrient digestibility and nitrogen balance were determined from days 24 to 30.

Food, faeces and urine samples were stored at -4°C during the collection phase until chemical analysis were carried out using the Weende-Method described by Nauman and Bassler (1976).

Data were subjected to analysis of variance and tested for significance among groups using the *t* test (Steel and Torrie, 1960).

Results and discussion

Substitution of crushed, whole soya beans for maize in the experimental diets led to an increase in both crude fat and crude protein content of the diets (Table 2).

Table 1 Ingredients in the experimental concentrate diets (g/kg as fed)

Ingredient	Diet			
	1	2	3	4
Maize	846	719	592	466
Soya bean	0	127	254	380
Groundnut hulls	42	42	42	42
Dairy concentrate	56	56	56	56
Calcium carbonate	21	21	21	21
Monocalcium phosphate	14	14	14	14
Urea	14	14	14	14
Vitamin and salt mix	7	7	7	7

Table 2 Composition of the hay and concentrate diets (g/kg dry matter)

Nutrient	Hay	Diet			
		1	2	3	4
Dry matter	996	984	986	986	987
Crude protein	47	75	101	116	134
Crude fibre	370	218	204	205	205
Crude fat	18	28	31	44	52
Crude ash	63	63	64	68	65

Table 3 Effect of level of crushed whole soya beans on apparent digestibility of crude nutrients and nitrogen retention by goats (no. = 4)

Nutrient	Diet							
	1		2		3		4	
	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Crude protein	52.8 ^a	7.8	54.2 ^a	3.6	68.8 ^b	8.0	75.3 ^b	13.5
Crude fibre	57.7 ^a	2.1	54.1 ^a	2.4	50.3 ^b	2.2	44.1 ^b	4.0
Crude fat	56.7 ^a	9.4	61.3 ^a	6.1	70.1 ^a	9.1	87.2 ^b	4.3
N-retained (g/day)	2.0	1.8	3.3 ^a	0.9	5.4 ^{ab}	2.9	6.8 ^b	3.2

^{a,b} Identical superscripts within a row indicate non-significant differences between groups ($P > 0.05$).

Apparent digestibility (Table 3) of crude protein increased parallel to increasing protein and fat content of the diets although Davenport, Boling, Gay and Bunting (1987) reported that dietary fat has no direct effect on the digestibility of crude protein in ruminant diets. Apparent digestibility of ether extract increased parallel to the fat content of the diet. This result contrasts with that of Zinn (1989), who found that the apparent digestibility coefficients of crude fat were 0.801 and 0.690 for steer diets containing 40 and 80 g/kg fat, respectively. The current finding is that there is an increase in the apparent digestibility of crude fat in ruminant diets with increasing level of dietary fat from 27 to 52 g/kg.

There was a significant decrease ($P < 0.05$) in the apparent digestibility of crude fibre with increased dietary fat content; this finding is consistent with reports in literature.

Nitrogen balance increased significantly ($P < 0.05$) with increases in the nitrogen and fat content of the food.

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