Live weight gains and carcass characteristics of indigenous Matabele goats fed browse fruits[1]

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Abstract

A feeding trial with 66 castrated indigenous goats (initial body weight 20.0±1.13 kg) was conducted to evaluate the nutritive value of tree fruits as protein supplements: *Dichrostachys cinerea, Acacia erioloba, A. erubescens, A. nilotica* and *A. tortilis* were compared with a commercial feed, for growth performance and carcass traits of indigenous goats. Goats were randomly assigned to one of the six treatments (11 animals /treatment) and were individually fed for 60 days. Diets offered had an effect ($P<0.05$) on growth performance and carcass traits. A second experiment was undertaken to assess intake, digestibility and nitrogen retention of the six diets. Lowest levels ($P<0.05$) of intakes, digestibility and nitrogen retention were recorded in animals receiving *A. nilotica* fruits (pods). Although animals were restricted to receiving a maximum of 200 g of supplement per day, results indicate the potential of pods as affordable alternative protein sources for livestock.

Introduction

There is a dearth of information on the use and value of non-conventional feeds as pen-finishing supplements for local goats. Dry and mature fruits from *Acacia* and other tree species are potential protein sources for goats in semi-arid areas of Zimbabwe (Mlambo *et al.*, 2002). Although goats have the advantage that they can survive under harsh environments there is need to develop finishing strategies using non-conventional feed for use in the smallholder sector. Goats are important as a source of meat and other products, including milk, skins and manure. A lot of interest is now being directed towards utilization of non-conventional natural feed resources for supplementing livestock on rangelands in the semi-arid areas.

The present study was undertaken to evaluate nutrient utilization of tree fruits as protein supplements. The fruits were compared with a commercial feed. A metabolism trial was also undertaken to assess intake, digestibility and nitrogen retention of the diets.

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Materials and methods

The study was carried out at Matopos Research Station (20°23′S and 28°28′E) in south-west Zimbabwe. The natural vegetation is dominated by thorny *Acacia* species and ground cover comprises perennial grasses with occasional annuals (Ward *et al.*, 1979).

Experiment one

A feeding trial, in which 66 indigenous castrated male goats were allocated to six treatments, was conducted. Average age of animals was 17 months. Animals were fed for 60 days. Animals were randomly allocated to one of the six diets (supplements), consisting of fruits of: *Dichrostachys cinerea; Acacia erioloba; A. erubescens; A. nilotica; A. tortilis;* and a commercial feed (a positive control). Animals were given the supplement of 200 g air-fresh material per day in two equal feeds, together with hay *ad libitum*. Animals were fed individually in crates. Water was available at all times. Slaughter procedures and carcass data collection were done as described by Baffour-Awuah, Matika and Sikosana (2000).

Experiment two

In the second experiment intake was measured. Thirty indigenous castrated goats (average weight 26 kg, age about 17 months) were allocated at random to one of six treatment (supplement) groups (five animals each*)*. The supplements were: cottonseed meal, *A. erioloba* fruits*; A. erubescens* fruits*; A. nilotica* fruits*; D. cinerea* fruits*;* and a commercial feed (goat meal). Animals were individually penned and fed. Half the feed was offered at 0800 hours and the other half at 1400 hours. Refusals were recorded daily and sampled, and then bulked for each animal over seven days.

Total faeces and urine were collected in days 21-28, for digestibility, and nitrogen retention (NR) determination. Daily samples for each animal was bulked over the seven days and stored at –4° C.

Samples were analysed using procedures described by AOAC (1990).

Results

Experiment one

Diets offered had an effect ($P<0.05$) on animal performance (Table 1). Final weights ranged from 18.5 kg to 21.2 kg resulting in cold carcass weights between 6.3 kg to 7.9 kg. Three diets led to a reduction ($P<0.05$) in daily gains. Goats receiving a commercial feed performed better ($P<0.05$), in all parameters measured, than those receiving tree fruits. Goats receiving *A. nilotica, A. erioloba and A. erubescens* fruits had significantly lower growth rates ($P<0.05$) compared to other treatments. Results show that tree fruits can be used in finishing diets for young animals.

Table 1 *Growth and carcass characteristics in young goats fed tree fruits or a commercial feed in experiment one*

Treatments	*Acacia Erioloba*	*A. Erubescens*	*Dichrostachys cinerea*	*A. nilotica*	*A. tortilis*	*Commercial feed*	*s.e.d.*
Initial weight (kg)	20.1	20.3	20.0	20.1	20.1	19.4	1.13
Final weight (kg)	19.9^{ab}	20.2^{ab}	20.3^{ab}	18.5^{b}	20.9^{ab}	21.2^{ab}	1.10
Hot carcass weight (kg)	7.0^{ab}	6.8^{ab}	6.8^{ab}	6.5^{b}	7.4^{ab}	8.0^{ab}	0.24
Cold carcass weight (kg)	6.8^{ab}	6.7^{ab}	6.7^{ab}	6.3^{b}	7.3^{ab}	7.9^{a}	0.24
Carcass length (cm)	50.3^{a}	51.0^{a}	49.7^{a}	49.4^{a}	50.8^{a}	51.15^{a}	1.16
Daily gain (g)	-3.3^{a}	-1.9^{a}	4.8^{ad}	-27^{c}	13.3^{d}	27.7^{b}	6.02
Dressing percentage	41.5^{c}	41.1^{c}	40.1^{c}	41.8^{bc}	42.3^{abc}	45.5^{a}	1.34

^{ab} Means within rows with different superscripts differ significantly (P<0.05)

Experiment two

Table 2 *Live weights (kg), daily intakes (g DM) of hay and supplements (tree fruits, cottonseed meal or goat meal), dry matter (DM), organic matter (OM), neutral detergent fibre (ADF and acid detergent fibre (ADF) digestibility (g/kg DM) and N retention (*NR, *g/d) of the whole diets offered to castrated male goats in experiment 2*

	Cottonseed meal	***Acacia erioloba***	***A. erubescens***	***A. nilotica***	***Dichrostachys cinerea***	**Goat meal**	**LSD**
Live weight	26.4	26.8	26.0	24.4	26.7		
Fruit intake	183	183	138	44	82	183	
Total intake	719^{a}	731^{a}	669^{ab}	491^{b}	844^{a}	774^{a}	187.7
Dig.							
DM	551	545	510	501	571	598	7.23
OM	733^{ad}	725^{ac}	697^{ab}	667^{b}	762^{cd}	747^{ad}	5.01
NDF	513	515	483	472	548	579	7.72
ADF	484	494	500	452	494	636	8.25
NR	5.8^{c}	2.1^{ad}	1.3^{d}	-0.5^{b}	3.0^{a}	5.8^{c}	1.31

^{ab} Means within rows with different superscripts differ significantly (P<0.05)

Goats receiving *D. cinerea fruits,* cottonseed meal and goat meal had the highest (P<0.05) hay intakes. *Acacia nilotica* fruits reduced intake. (P<0.05). The lower intakes of *A. nilotica* compared to other fruits may be due to anti-nutritional factors (Tanner *et al.*, 1990; Sikosana *et al.,* 2001; Ncube *et al.,* 1994). Nitrogen retention was significantly different (P<0.05) across treatments with goats receiving cottonseed meal or a commercial feed having the highest retention. Goats receiving *D. cinerea* fruits had the highest retention of

those receiving fruits. Animals receiving *A nilotica* had the lowest (P<0.05) nitrogen retention.

Conclusions

Low growth rates across treatment where goats received tree fruits could have been due to anti-nutritional factors found in the fruits. The limited amounts of air-fresh feed (200 g/head/day) could have had an impact on growth and carcass traits. The potential to replace commercial feeds with tree fruits as a protein source is demonstrated. More research is needed on the optimum quantities of tree fruits to include in pen-finishing diets. Usually fruits have been used to provide supplements to grazing animals in the dry season. More research is needed before recommending the use of *A. nilotica* fruits, which are the most abundant in most semi-arid areas of Zimbabwe. Smallholder farmers are interested in reducing feed costs by using recommended tree fruits as goat feed, in meat and milk production to increase marketable products. Conservation and added value of browse species will result in a stable ecosystem, which will be able to sustain livestock in drier areas. In drought years, in drier areas of Zimbabwe, farmers can expect a bumper harvest of a 'protein source' from tree fruits, for their livestock.

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