

Effects of supplementing Rhodes grass hay (*Chloris gayana*) with selected indigenous browse species on voluntary feed intake, feed digestibility and live weight change of goats

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Abstract

The study consisted of a 60 day feeding trial using 12 goats with mean initial body weight and age of 17.6 kg and 6 months, respectively. The objectives were to examine the effects on voluntary feed intake, feed digestibility and live weight change, of supplementing low quality Rhodes grass hay with browse from *Acacia brevispica* and *Berchemia discolor*. The three dietary treatments were offered in a completely randomized design with four animals per treatment.

Supplementing low quality Rhodes grass hay (4% CP in DM) with leaves of *Acacia brevispica* and *Berchemia discolor* doubled the DM intake and converted a loss in live weight of 48 g/day into moderate growth rates of 21 and 22 g/day.

Key words: *Acacia brevispica*, *Berchemia discolor*, browse

Introduction

The insufficiency and poor quality of the existing protein and energy feeds, particularly during the dry season is the most challenging limitation in small ruminant production in the tropics (Njoya et al 2005; Olafadehan et al 2009). In the dry and drought times forage from browses is often obtainable when grasses and crop residues are in short supply (Aregawi et al 2008). Legume tree forages are usually rich in crude protein and minerals and can be used as supplements to mitigate the effects of low quality feeds (Ondiek et al 2013).

The objective of this study was to evaluate the effect on voluntary DM intake, feed digestibility and live weight change when leaves of *Berchemia discolor* and *Acacia brevispica* were fed as supplements to goats fed low quality Rhodes grass hay.

Materials and methods

Site

The selected browse trees *Acacia brevispica* and *Berchemia discolor* are located in communal grazing ranges in Marigat Sub-county of Baringo County; they were harvested during the wet season. The area is located at altitude of 1080m above sea level with an average annual rainfall and temperature of 700mm and 24°C, respectively. The experiment was conducted at Egerton University,

Tatton Agriculture Park in Njoro, Kenya, which is situated at an altitude of 2238m above sea level with mean annual rainfall and temperature of 1000 mm and 20°C respectively (Jaetzold and Schmidt 2006).

Animals

Twelve goats with initial average live weight and age of 17.6 kg and 6 months, respectively were housed in individual pens and treated against internal parasites, using Nilzan⁺ (Coopers Ltd), and sprayed with Triatix (Coopers Ltd) for external parasites.. Salt licks and water were offered *ad lib*. The animals were assigned to three diets with four goats per treatment.

Diets

The basal diet consisted of Rhodes grass (*Chloris gayana*) hay that was purchased from a farm in Njoro. Leaves of the browses were collected by hand stripping and air dried under the shade for 2 to 4 days. The dried foliages were put in sacks and stored in a ventilated shed. Prior to feeding they were; milled to pass through a 4mm sieve.

Experimental design

The treatments were applied in a completely randomized design with four animals per treatment. The supplements were offered at 200 g/head (DM basis) at 07:30h to let the goats eat them before offering the hay. Refusals were collected before offering the basal diet. The Rhode grass hay (control) was introduced at 09:00h at 750g/head (DM basis) which ensured it was *ad libitum*. Feed refusals were collected, weighed and recorded every day in the morning before offering fresh hay. Initial body weight of the goats was taken as mean of two consecutive weighing after overnight fasting. Subsequent body weight measurements were taken every 7 days after overnight fasting until the completion of the experiment after 8 weeks.

Digestibility

During the eighth week fecal output was collected daily and kept in airtight plastic containers. At the end of the 7 days, samples were dried at 60°C for 72 hours (to determine DM content). They were ground and stored in airtight containers pending chemical analysis.

DM, nitrogen and ash were analyzed according to the standard methods of AOAC (1990). Neutral detergent fiber (NDF), acid detergent fibre (ADF) and acid detergent lignin (ADL) were determined according to the procedure described by Van Soest et al (1991). Phenolics were extracted using 70% aqueous acetone following the procedures described by Makkar (2003). Total extractable phenolics (TEPH) were determined using Folin-ciocalteu reagent and tannic acid as the standard. Condensed tannins (CT) were determined according to the method described by Porter et al (1986).

Statistical analysis

Data on feed intake, digestibility and live weight change (ADG) were subjected to analysis of variance using the General linear model procedure of statistical analysis system of SAS (2002). Initial live weight was fitted as a covariate in the analysis of feed intake and live weight change. Means were separated using the Tukey HSD (Tukey Honestly Significant Difference Test) at 5% significance. The ANOVA model used for statistical analysis was:

$$Y_{ij} = \mu + \alpha_i + \beta_j$$

where:

Y_{ij} = observation from the i^{th} treatment and j^{th} replicate,

$\hat{\mu}$ = overall mean,

τ_i = effect of the i^{th} treatment

ϵ_{ij} = random error term.

Results and discussion

Chemical composition

The relatively high CP content of *Acacia brevispica* and *Berchemia discolor* (Table 1) shows their potential as supplements for goats in the arid and semi-arid regions of Kenya. The moderate NDF content of the browse species is indicative of relatively high digestibility (Osuga et al 2005).

Table 1. Chemical composition (g/kg DM except for DM which is on air-dry basis) of the leaves of the browse species and of Rhodes grass (*Chloris gayana*)

	DM	OM	CP	EE	NDF	ADF	ADL	TEPH
<i>Acacia brevispica</i>	926	938	132	53.4	295	216	254	37.6
<i>Berchemia discolor</i>	918	945	162	21.3	171	155	144	49.2
Rhodes grass	920	921	41.4	21.0	69	503	478	6.1

Supplementing low quality Rhodes grass hay (4% CP in DM) with leaves of *Acacia brevispica* and *Berchemia discolor* doubled the DM intake and converted a loss in live weight of 48 g/day into moderate growth rates of 21 and 22 g/day (Table 2; Figures 1 and 2).

Table 2. Mean values for DM intake, LW gain and apparent digestibility by goats fed Rhodes grass hay alone or supplemented with *Acacia brevispica* or *Berchemia discolor*

Control	<i>A. brevispica</i>	<i>B. discolor</i>	SEM	<i>p</i>
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DM intake, g/d					
Rhode grass	53.4 ^a	33.0 ^c	37.6 ^b	0.69	<0.0001
Browse	0.0 ^c	84.7 ^b	87.6 ^a	0.61	<0.0001
Total	53.4 ^c	117.7 ^b	125.2 ^a	0.78	<0.0001
LW gain. g/d	-47.8 ^b	21.4 ^a	22.3 ^a		<0.0001
Digestibility, %					
CP	78.8 ^a	70.1 ^{ab}	64.8 ^c	2.69	0.015
OM	9.28 ^a	9.06 ^a	9.02 ^a	0.79	<0.0001
DM	3.645 ^a	2.68 ^c	3.652 ^a	0.19	0.0075

^{abc} means values without common superscript differ at $P < 0.05$

Figure 1. Effect of browse supplementation on DM intake of goats fed a basal diet of Rhodes grass hay with and without leaves of browse trees

Conclusion

- Supplementing low quality Rhodes grass hay with leaves; of *Acacia brevispica* or *Berchemia discolor* resulted in higher DM intake and moderate gains in live weight of 20 and 22 g/day; on hay alone the goats lost 48 g/day

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