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Performance of Tswana Goats Fed Two Levels of *Terminalia serecia* and *Boscia albitrunca* as Supplement to Buffel Grass

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Abstract: This study was to evaluate the impact of feeding *Terminalia serecia* and *Boscia albitrunca* at 2 levels on growth rate and feed intake of Tswana goats. The experiment was conducted at Botswana College of Agriculture farm for 61 days. Fifteen female and 10 castrated yearling male goats were randomly divided into 5 groups of 5 goats (3 female and 2 male) each, using complete randomized design and balancing them according to sex and weight. They were selected from College herd of about 200 Tswana goats based on age and weight. The goats were housed individually in goat units under a common roof made up of corrugated iron sheets with a dwarf wall to allow free ventilation on a concrete floor. The goats were weighed for initial, interim and final weights every month using Avery walk in scale. Buffel grass was given at 400 g to all animals supplemented with 250 g wheat bran. The treatments were as follows; 400 g *Terminalia serecia*, 800 g *Terminalia serecia*, 400 g *Boscia albitrunca* and 800 g *Boscia albitrunca* were provided to animals on treatments1, 2, 3 and 4, respectively while those in the control group were offered Lucerne as supplement. The browse leaves and twigs were cut and wilted and fed to the goats the following day. Cleaning of the pens and removal of leftovers from the previous day were done before each day's feeding. Water was made available at all times. The animals were fed *T. serecia* or *B.albitrunca* at two levels daily (400 or 800 g).The browse leaves were fed together with buffel grass hay (*Cenchrus ciliaris*) as basal ration while wheat bran was offered at 250g/day/animal as an energy source. Average Daily body weight Gain (ADG) was obtained by subtracting the initial body weight from the final body weight and dividing by the number of days animals were in the treatment. All data collected were statistically analyzed using ANOVA and Duncan's new multiple range test was used for mean separation at 5% P level. Results obtained show that there a was significant ($p<0.05$) difference in ADG of goats fed Lucerne compared to those on browses. Total intake of dry matter was significantly affected by level and type of supplement. The study shows that goats fed browses as supplement gained weight but lower than goats fed on Lucerne as supplement. Feed conversion of Tswana goats fed browses as a supplement were lower than those fed Lucerne as supplement, showing that Tswana goats cannot utilize these browses as efficiently as they utilize Lucerne.

Key words: Performance, buffel grass, agricultural, Tswana goats

INTRODUCTION

Multipurpose trees and shrubs fodder are important feed resources for bridging the seasonal deficits in feed quantity and quality (Aganga *et al*., 2001). Browse plants provide protein and minerals lacking in grasses during the dry season. *T. serecia* and *B. albitrunca* are among the plants that grow naturally in the rangeland and are commonly browsed by goats in Botswana (Aganga, 2002).

T. serecia is a small to medium-sized deciduous or semi-deciduous tree of the savanna woodland. *B. albitrunca* is a short tree that is widespread in dry, open woodland and bushveld and is often associated with termite mounds. The leaves of both *T. serecia* and *B. albitrunca* provide nourishing fodder for game and also for livestock. In times of drought when food is critically short, farmers often remove the branches to feed their cattle and sheep. In both species new shoot spring up from the severed areas providing further food source for the animals (Norton,1994).

The goat has a well-developed defense against a wide range of potentially toxic compounds in their feed, particularly those that occur in some tree or shrub leaves. The tree foliage plays a major role in providing forage for goats during the dry season in Botswana. Browse has an

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advantage over grasses in maintaining a high nutritive quality throughout the dry season when grasses have dried out.

Botswana has an estimated goat population of 1,900,990 reared traditionally and 15284 reared under commercial system (Botswana Annual Agricultural survey Report, 2003). The Tswana goat breed is the most common indigenous goat in Botswana, with average adult body weights of 34 and 38 kg for female and male respectively. It is a multicolored, medium sized breed with lopping ears, short fine hair structure, predominantly horned and bearded (Aganga *et al*., 1996). The present study was to look at the influence of browse feeding *T. serecia* and *B. albitrunca* at 2 levels on growth rate and feed intake of Tswana goats.

MATERIALS AND METHODS

The experiment was conducted at Botswana College of Agriculture Content Farm for 61 days. The climate in Gaborone is generally subtropical with temperature rising to 35-40°C during summer (October-April). The rainy season spans from November to April with erratic and sporadic rainfall. The average annual rainfall in Gaborone averages 450-500 mm. The experimental feeds were analysed for dry matter and crude protein using the procedures of AOAC (1996) and browses for tannins according to the procedures of Makkar (2000).

Goat feeding and housing: Fifteen female and ten castrated yearling male goats were randomly divided into 5 groups of 5 goats (3 female and 2 male) each, using completing randomized design and balancing them according to sex and weight. They were selected from the College herd of about 200 Tswana goats. The goats were injected with ecomectin at 0.5 mL per goat, to prevent endo and ectoparasites before the beginning of the experiment. The goats were housed individually in goat units under a common roof made up of corrugated iron sheets with a dwarf wall to allow free ventilation on a concrete floor. The goats were weighed for initial, interim and final weights every month using Avery walk in scale.

Buffel grass was given at 400 g supplemented with 250 g wheat bran, 400 g *T. serecia*, 800 g *T. serecia*, 400 g *B. albitrunca* and 800 g *B. albitrunca*. The control group were offred the basal diet with Lucerne (*Medicago sativa*) as supplement. The browse leaves and twigs were cut and wilted and fed to the goats the following day. Cleaning of the pens and removal of leftovers from the previous day were done before supplying each day's ration. The water and feeds provided and the leftovers were measured daily.

All data collected were statistically analyzed using ANOVA and Duncan's new multiple range test was used to separate significantly ($p<0.05$) different means (SAS, 2004).

RESULTS AND DISCUSSION

The chemical composition and dry matter content of the feed given to goat are shown in Table 1. The dry matter varied from 41.1% for *T. serecia* to 87% for *Cenchrus ciliaris*. Dry matter is higher for those feed given as hay (*C. ciliaris and M. sativa*). Crude protein for the browse plants was within the same range with *T. serecia* highest at 10.5% and *B. albitrunca* being the least at 9.04%. The tannin values of the browse were 0.7-0.9 for *T.serecia* and *B.albitrunca*, respectively.

Data on growth, feed intake, feed conversion ratio, daily dry matter intake and daily water intake of the goats during the experimental period are shown in Table 2. The treatments effects on average body weight gain were not significant ($p>0.05$), but the goats on Lucerne as a supplement had a slightly higher average daily gain. The average daily dry matter intake of the Lucerne, low *B. albitrunca*, high *B. albitrunca*, Low *T. serecia* and high *T. serecia* and supplement was 923, 653, 783, 604 and 697g, respectively. The average daily water intake (litres day^{-1}) for goats fed Lucerne was higher at 2.84±0.16 than the goats on low *B. albitrunca* (2.13±0.16), high *B. albitrunca* (2.37±0.16), Low *T. serecia* and (1.77±0.16) and high *T. serecia* and (1.87±0.16). The average daily body weight gain was higher for goat on Lucerne at 0.124 kg, compared to 0.065, 0.072, 0.072 and 0.082 kg for the Low *B .aibitrunca*, high *B. aibitrunca*, Low *T. serecia* and High *T. serecia*, as supplements respectively. Feed conversion efficiency was lower for the goats on Lucerne at 7.4. Goats on low *B. albitrunca,* high *B. albitrunca*, low *T. serecia* and high *T. serecia*, had 10, 10.8, 8.3 and 8.7, respectively.

Table 2 shows the body weight gain (kg), which indicated the extent of feed utilization by the goats on the differently treatment groups. Goats given Lucerne had the highest body weight gain of 7.6 kg in 61 days as compared to the browses. This is because Lucerne does not contain tannin so protein in it is utilized more efficiently. Among the browses, goats given high *T. serecia* had a higher weight gain of 4.9 kg in 61 days than those given low *T. serecia*. Goats on low *T. serecia* had 4.4 kg body weight gain. Goats that fed on browses

Table 1: Dry matter content (%), crude protein and tannin content of feeds fed to the goat

	M. sativa	*T. serecia*	*B. albitrunca*	*C. ciliaris*
Dry matter (%)	86	41.1	55.5	87
Crude protein	11.68	10.5	9.04	6.84
Tannin	-	0.9	0.7	-

Table 2: Intake (on dry matter basis) and response of Tswana goats during the experimental

Feeds type	Control Buffalo grass +Lucerne	Treatment 1 Buffalo grass +low *B. albitrunca*	Treatment 2 Buffalo grass +high *B. albitrunca*	Treatment 3 Buffalo grass +low *T. serecia*	Treatment 4 Buffalo grass + high *T. serecia*
Initial weight (kg)	20.2±0.1	20.2±0.1	20.0±0.1	20.0±0.1	20.0±0.1
Final weight (kg)	27.8±0.2	24.2±0.2	24.4±0.2	24.4±0.2	24.9±0.2
Body weight gain(kg)	7.6±0.2	4.0±0.2	4.4±0.2	4.4±0.2	4.9±0.2
Average daily body weight gain (kg)	0.124±0.003	0.065±0.003	0.072±0.003	0.072±0.003	0.080±0.003
Average daily dry matter intake(g)	923±23.5	653±11.1	783±9.0	604±19.4	697±12.7
Average daily DM grass hay intake (g)	274±10.2	314±8.0	323±10.0	303±19.1	294±8.6
Average daily DM browse Intake (g)	537±15.7	292±7.3	512±16.4	301±6.8	544±13.0
Feed conversion (g g^{-1})	7.4±1.2	10.0±1.7	10.8±1.7	8.3±1.6	8.7±0.9
Average daily H_2O intake (litres)	2.84±0.16	2.13±0.16	2.37±0.16	1.77±0.16	1.87±0.16

Values are mean±standard error

had lower body weight gain compared to the control on Lucerne. This might be due to the presence of condensed tannins in browses fed which bound protein and reduced utilization by the animal. However, lucerne is expensive and many small scale farmers cannot afford to buy Lucerne to supplement their goats. A bale of 25 kg Lucerne hay cost P55.00 (P6.5 = US$ 1) but browses are obtained free from the rangelands using family labour.

The feed conversion of goats fed with high *B. albitrunca* as supplements was also high with 10.8 g g^{-1}, which means that the animals need to consume 10.8 g dry^{-1} matter to gain 1 g in body weight, while those supplemented with both high and low *T. serecia* needs to eat 8.7 and 8.3 g, respectively to gain 1g in body weight. Generally weight gain of goats on all the feeds were not significantly different ($p>0.05$) implying that the browse plants have the potential to provide enough nutrients to the goats, despite the presence of condensed tannins.

Dry matter intake of Tswana goat is a factor of primary importance, since the capacity for voluntary feed intake is a basic limiting factor in feed utilization. Dry matter can be limited by high fibre, slowly digestible forage (highly cell wall content or NDF levels which increase retention time, therefore physical fill becomes limiting and intake is reduced. Dry matter intake can also be used to reflect energy intake. Goat supplemented with Lucerne (control) had the highest average daily dry matter intake of 923 g while goats supplemented with high *B. albitrunca* consumed 783g day^{-1}.

Water intake is a dietary essential. According to Aganga (1992) an animal's first response to water restriction is to reduce its voluntary feed intake, but goats in this study were offered water daily. Water intake also differs with the type of feeds; goats on feeds containing higher levels of moisture consumed lower amounts of drinking water. Water intake is influenced by the dry matter content in the feed, the higher the dry matter intake the higher the water intake. Goats fed on Lucerne had a higher dry matter intake than those supplemented with the browses. The other factor that may influence water intake is exercise since this increase muscular activities, which generates heat. However, the goats in this experiment were only influenced by the feeds since all experimental goats were penned in individual pens under the same roof and environmental condition.

CONCLUSION

This study showed that browse plants can serve as protein sources, since they are rich in crude protein and therefore can be used as supplement to low quantity forage like *C.ciliaris* hay although goats perform better on Lucerne supplement.

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