ACACIA AND OTHER TREE PODS AS DRY SEASON FEED SUPPLEMENTS FOR GOATS

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Abstract

Most rangelands in Zimbabwe are dominated by *Acacia* and other pod, or fruit, producing trees, including *Dichrostachys cinerea*, *Colophosperm mopane*, genera of *Pilliostigma* and *Guibortia*. These trees produce nutritious pods which are high in crude protein. The pods ripen during the dry season and can be used to supplements livestock when there is an inadequate supply of feed on rangelands. At present, smallholder farmers rarely use browse pods as supplements to livestock, especially goats. Feeding trials using browse pods have been undertaken on station to determine intake and assess the performance of lactating goats and their progeny. Information generated is being demonstrated in the rural areas by organizing cooperating farmers to host feeding trials using different browse pods of their own choice. Results of on-station work are presented.

Introduction

In Zimbabwe the feed related factors that limit productivity vary at different times of the year (Sikosana and Maphosa, 1995). Early in the dry season, feed quality deteriorates rapidly, followed by a reduction in quantity, as a result of high grazing pressure and senescence. Average dry season grazing contains less than three per cent crude protein (Elliott and Folkema, 1961). This seasonal undernutrition results in poor growth rates in growing animals, death occurring in severe seasons, and a low off take rate. Feed supply is the most pervasive constraint in livestock production (Winrock International, 1993). The available feed resources across the country are natural rangelands, crop residues and cultivated pastures. Seasonal fluctuation in feed supply is a problem in all ecological zones.

Livestock, including goats, in the drier ecological zones depend on natural rangelands, containing a variety of grasses and vegetation dominated by browse species. Studies at Matopos Research Station have shown that goats spend up to 60-70 % of their feeding time browsing (Sibanda 1986). Browse can be eaten as fresh leaves, dried leaves and ripe pods. Browse pods are high in nutritive value (Ncube and Mpofu, 1994; Tanner, Reed and Owen, 1990) and can be used as supplements with low quality roughages. Most rangelands in Zimbabwe contain *Acacia* species and other pod, or fruit, producing trees namely *Dichrostachys cinerea, Colophosperm mopane*, and genera of *Piliostigma* and *Guibortia.*

Distribution of *Acacia* species in Zimbabwe

In Zimbabwe, *Acacia* species are found mostly in arid savanna (Natural Regions (NR) IV and V) with a few in wetter regions (Timberlake, Fagg and Barnes, 1999). The most common

Acacia species in Zimbabwe are: *A. karoo, A. tortilis, A. nilotica, A. erubescens, A. erioloba, A. robusta, A. gerradii, A. rehmanniana, A. galpinii, A. nigrescens, A. Faidherbia albida*. Other browse species include the genera *Pilliostigma* and *Giubortia,* and *D. cinerea.*

Use of *Acacias* in Zimbabwe

Timberlake, *et al.,* (1999), have reviewed the uses of *Acacia* species in livestock production. Leaves, pods and young shoots are utilized by both domestic livestock and wildlife. *Acacia* browse trees provide forage throughout the year. Before the rains they provide a much needed browse flush and during the dry season provide pods. *Acacias* produce nutritious pods that ripen and fall during the dry season when there is little forage apart from low quality forage. Species with indehiscent pods, such as from *A. erioloba, A. nilotica, A. tortilis and A. Faidherbia albida,* can be collected and stored for feeding later in the dry season to pregnant and lactating goats and other livestock. The crude protein of these pods ranges from 10-15 per cent. Smallholder farmers rarely offer supplements to their goats, although it is probably the most important factor affecting performance. Supplementing small ruminants with browse improves survival rates of the young.

One of the major disadvantages of browse as a livestock feed is the presence of perceived anti-nutritional factors such as phenolic compounds, of which tannins represent a large part. Their toxicity can be reduced by boiling the pod, milling, or mixing with sulphur or molasses (Steyn, 1934; Timberlake, 1980).

Other use of browse trees

*Dichrostachys cinerea*r pods are used to treat asthma and *A. tortilis* can be used to as a dressing for burns (Kindness *et al.,* 1999).

Farmer knowledge on pods

Most farmers appreciate the idea of collecting pods to supplement goats during the dry season, although some lack understanding of the benefits of pods to livestock (Kindness, *et al.*, 1999, report of participatory rural appraisal (PRA) undertaken at the start of this project.

Feeding trials on-station

Between May 1999 and December 2001 experiments have been undertaken to determine intake and assess the performance, including growth rates of progeny, of lactating goats supplemented with pods. In the experiments reported here different browse pods are being tested as supplements for goats during the dry season. Such information will be useful to goat farmers who cannot afford to buy concentrate feeds.

Experiment one

Forty-five indigenous female goats were divided randomly into three groups. Two groups were supplemented with crushed pods of A*. erioloba* or *D. cinerea*, one group was unsupplemented. Supplements offered were 200g/day/animal, 45 days before and 45 days after kidding.

Results

Birth weights and weaning weights of kids were significantly different (P<0.05) across treatments (Table 1). Twin-born kids had both lower birth and weaning weights, except for

kids weaned in the group where does were supplemented with *A. erioloba*. Supplementation with *D. cinerea* improved kid growth rates and survival rates.

Table 1 Kid birth and weaning weights (kg, single(s) and twins (t)) and mortality rates (s, t) after supplementation for 45 days before and after kidding (Year 2000)

		Acacia erioloba	***Dichrostachys cinerea***	**Non-supplemented**
Birthweight	s	2.3 (n=6)	2.7 (n=8)	2.9 (n=11)
	t	2.1 (n=20)	2.3 (n=10)	2.2 (n=12)
s.e.m		0.11	1.12	0.05
Weaning weight	s	5.4	11.8	10.6
	t	8.2	9.5	6.4
s.e.m		0.56	0.13	0.77
Kid mortality %	s	50	0	0
	t	15	0	16

Experiment two

Animal management is similar to the first experiment except that five browse species are being offered, reflecting greater availability. Animals are either supplemented with pods of *A. erioloba, D. cinerea, A. nilotica, A. tortilis*, or *A. erubescens*. One group is not supplemented. The experiment is on-going. Kid birthweight are shown in Table 2.

Table 2 Kid birth weights (kg) of single(s) and twins (t) after supplementation for 45 days before and after kidding (Year 2001)

Birth weight	***Acacia erioloba***	***Dichrostachys cinerea***	***A. nilotica***	***A. tortilis***	***A. erubescens***	***Non-supplemented***
s	2.9 (n=7)	3.1 (n=5)	2.8 (n=7	2.8 (n=6)	3.2 (n=6)	2.8 (n=7)
t	2.5 (n=14)	3.5 (n=14)	2.4 (n=14)	2.5 (n=18)	2.4 (n=14)	2.3 (n=16)
s.e.m	0.09	0.10	0.08	0.09	0.15	0.10

Experiment three

Dry matter intake was measured in 30 castrated male goats, housed in metabolism crates. There were five animals per treatment.

Results

Goats supplemented with cottonseed meal (CSM), *A. erioloba* and *D. cine*rea had the highest (*P*<0.001) intake of supplements (see Table 3). Lower intakes of *A. nil*otica may have been due to anti-nutritional factors and needs further investigation. Digestibility and nitrogen retention were highest (*P*<0.05) in animals supplemented with CSM, *A. erioloba* and *D. cinerea*.

Table 3 Daily intakes, (g/DM/day and gDM/kgW $^{0.75}$), dry matter digestibility (%, DMD) and N retention (g/d, NR) of hay and supplements fed to castrated male goats.

	Cottonseed meal	*Acacia erioloba*	*A. erubescens*	*A. nilotica*	*Dichrostachysci nerea*
Live weight(kg)	26.4	26.8	26.0	24.4	26.7
Daily pod intake:					
DM	183	183	138	44	182
DM/kgW$^{0.75}$	15,7	15.6	12.0	3.9	15.5
Daily hay intake					
DM per day	529	555	540	468	662
DM/kg$^{0.75}$	45.4	47.1	47.1	42.6	56.3
Total daily intake					
DM	712	738	679	511	844
DM/kg$^{0.75}$	61.2	62.6	58.9	46.6	71.8
DMD	0.55	0.54	0.51	0.49	0.57
NR	5.8	2.1	1.3	-0.5	3.03

Experiment four

Forty indigenous female goats were randomly allocated to four groups. Two groups were fed supplements of *D. cinerea* pods, the other two were not supplemented. One group receiving a supplement and one non-supplemented group were hand milked once a day. The other two groups were not milked.

Results

Kids from the supplemented and not milked had the highest *(P*<0.05) growth rates (Table 4).

Table 4 Birth weights (kg) of single(s) and twins (t) born kids and kid mortality rates (s, t), from does supplemented with *D. cinerea* (after supplementation for 45 days before and after kidding) and non supplemented (Year 2000)

	MS[1]	nMS[2]	MnS[3]	nMnS[4]
Birth weight	2.84	2.65	2.41	2.39
Weaning weight	8.85	9.79	7.42	7.95
Kid mortality%				
S	0	0	0	0
T	17	0	14	38

[1]MS, Milked, Supplemented

[2] nMS, Not milked, Supplemented

[3]MnS, Milked, not supplemented

[4]nMnS, Not milked, not supplemented

Faecal worm egg counts

The worm burden in does supplemented with browse pods has been monitored (Figures 1 and 2).

Indigenous female goats in the feeding trials reported above were also monitored for levels of worm infestation, by counting the eggs per gram (epg) of faeces. Faecal samples were collected monthly from the rectum of each animal from the start of feeding, 45 days before kidding and 45 days post-partum.

Figure 1 shows generally low levels of epg in all animals, both fed and non-fed. However, in December 1999 high levels of epg were recorded and animals had to be dosed with a proprietary anthelmintic to reduce them.

In early September 2000, does were dosed and feeding commenced shortly afterwards. At the end of October 2000, low levels of epg were recorded in the supplemented animals, but non-supplemented animals had high levels of epg. All animals were dosed at this stage.

It appears that some browse pods can have a positive effect in controlling levels of worm infestation. Individual species of browse pods need to be tested at different levels against known levels of worm infestation.

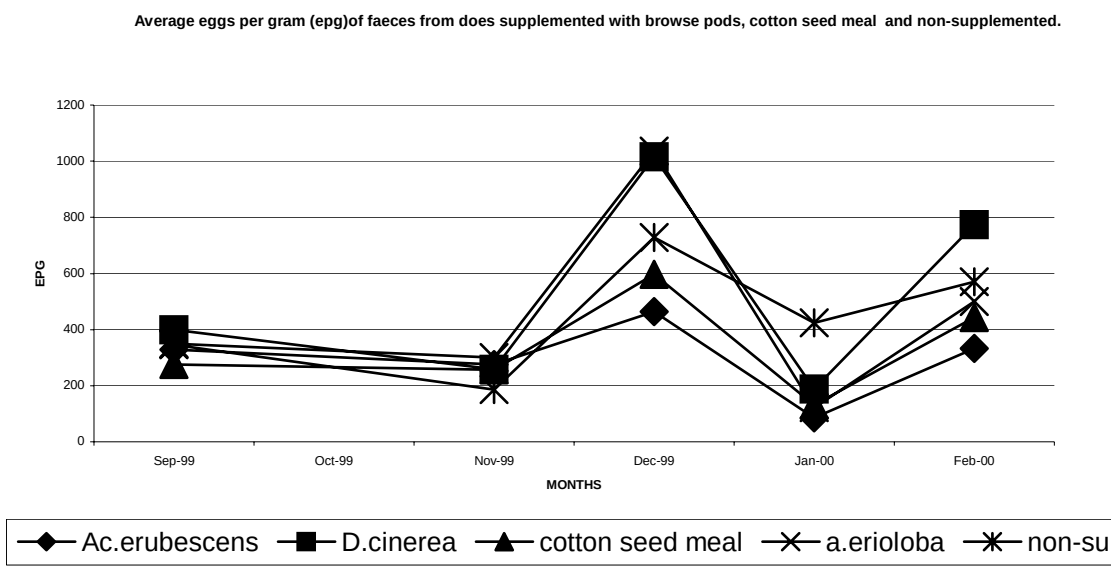

Figure One

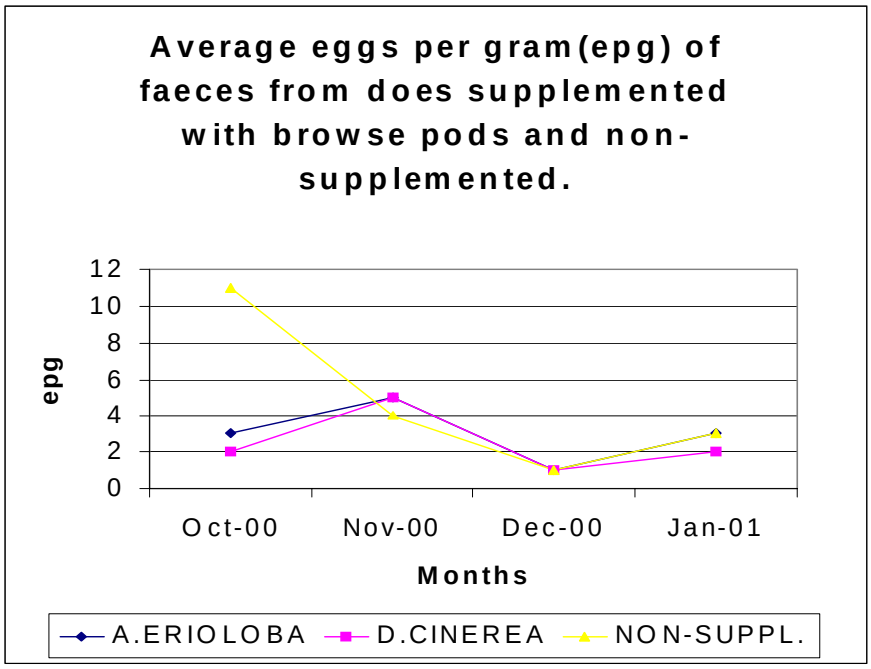

Figure 2

On-farm activities (2001-2002)

The current status is:

- Number of farmers involved: 78
- Number of animals being monitored: 318 lactating goats
- Average number of goats being monitored per farmer ranges from 5 –10 animals.
- Different farmers were using the following pods species: *A. erubescens, A. nilotica, A. tortilis*, and *D. cinerea*.

From the farmers' comments intake of *A. nilotica* pods by the goats was low. Goats preferred whole pods rather than crushed pods. Another comment was that kid survival and growth had improved through the supplementation, despite the fact that some of the kids are being eaten by jackals.

Some farmers have expressed the wish to finish young kids for sale (markets for goats need to be explored).

An evaluation form has been distributed to farmers who have been feeding their goats with pods. The form is composed of two simple questions:

1. farmers comments on the feeding of goats during the current dry season
2. farmers comments on what they would like to see being done under this programme, in the near future.

Measurements collected so far

- Monthly doe and kid weights
- Rainfall records on the sites for monitoring pod yield.

References

ELLIOTT, R.C. and FOLKEMA, K (1961) Seasonal changes in composition and yield of veld grass. *Rhodesia Agricultural Journal*, **58**: 186-187.

KINDNESS, H, SIKOSANA, J.L.N. MLAMBO, V. and MORTON, J.F.(1999) *Socio-economic surveys of goat-keeping in Matobo and Bubi Districts. Project code Y0020*. NRI Report Number 2451. Natural Resources Institute, Chatham, UK.

NCUBE, S. and MPOFU, D. (1994) The nutritive value of wild fruits and their use as supplements to veld hay. *Zimbabwe Journal of Agricultural Research*, **32:** 71-77.

SIBANDA, R.(1986) The browsing and general behaviour of indigenous goats in thornveld. *Zimbabwe Agricultural Journal,* **86**: 209-214.

SIKOSANA, J.L.N. and MAPHOSA, V.(1995) Growth and carcass characteristics of young indigenous (Matabele) castrate goats grazing *Acacia* thornveld, and offered supplementary feed during the dry season. *Journal of the Zimbabwe Society of Animal Production*, **7**: 199-202.

STEYN, D.G.(1934) The camel thorn tree and other *Acacia* species as stockfeed. *Farming in South Africa*, **9:** 89-90,106.

TANNER, J.C., REED, J.D. and OWEN, E., (1999) The value of fruits (pods with seeds) from four *Acacia* sp. Compared with extracted Noug (*Guizotia Abyssinica*) meal as supplements to maize stover for Ethiopian Highland sheep. *Animal Production*, **5**1: 127-133.

TIMBERLAKE, J., FAGG, C. and BARNES, R. (1999) *Field guide to Acacias of Zimbabwe.* CBC publishing, Harare, Zimbabwe. 160 pp.

WINROCK INTERNATIONAL LIVESTOCK RESEARCH AND TRAINING CENTRE (1993) A World Bank technical paper: *Sheep and goats in developing countries*. World Bank, Washington DC, USA.166pp.