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Browse preferences of goats in a Savanna rangeland in Zimbabwe

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The browsing behaviour of four free ranging goats was studied in the Wedza Communal Area of Zimbabwe over a four-day period in March 1997. Line intercepts were used to record the occurrence of browse species on range. Time spent on individual browse species was recorded. Preference indices for individual browse species were computed by relating relative frequency of consumption to relative frequency of occurrence on range. *Acacia karoo* had the highest relative frequency of occurrence. Of the 28 species that occurred on range, only 75 percent were consumed. Of these species, goats had a high preference for only 28 percent on which they spent 79 percent of their browsing time. Thirty percent of the highly preferred species had a trace occurrence on range. *Strychos cucculoides*, a trace species, had the highest preference index of 6.1. The correlation coefficient between relative frequency on range and relative frequency of consumption was 0.6. Crude protein content of the browse and the preference indices had a correlation coefficient of 0.16. Apparently, availability of the browse species and crude protein content did not fully explain the preferences. These preferences are important when considering increased sustainable goat production from range ecosystems.

Keywords: browse, preference, goats.

Introduction

Goats are a secondary but integral part of the farming systems in the smallholder sector of Zimbabwe and surveys show that in communal areas 85 percent of households own goats, compared to 60 percent that own cattle. The role of goats in range management has not been studied to any extent in Zimbabwe, yet, the majority of goats depend on the range for their survival (Ndlovu, 1994). In the few nutritional research publications made on goats, very little attention has been given to understanding the interactions between goats and the range forage resources. Such studies are necessary for understanding the adequacy of the natural feed resources for goat production and for building the basis for predicting animal performance from specific plant community types. This will be useful where there are efforts to increase household incomes by taking advantage of the high production levels, adaptation to harsh environments and high liquidity potential of goats.

The objectives of this study were to assess the preferences the goats have for different browse species relative to their availability on range.

Materials and Methodology

Study site

The study was conducted in Goneso Ward in the Wedza Communal Area of Zimbabwe. The area receives a mean annual rainfall of 750 mm and has a high potential for crop and livestock production. The physiognomic vegetation type for the area studied is Tree Bush Savanna.

Range composition

The line intercept method was used. Eight points were selected in the grazing area and from each point four 15 m lines were marked in the main cardinal directions. The individual browse species intercepted along each line were recorded. From these recordings, frequencies of species occurrence

on range were calculated using the formulae in Smeins and Slack (1982).

Feeding activities

Four female Mashona goats, two adults and two kids were selected from a flock of nine, and were followed and observed as soon as they were released to the grazing area according to the farmer's usual time table. Observations commenced at the same time each day and were done over four consecutive days by four persons using the observation method of Altmann (1974). There were four observation sessions on each animal in the morning and four in the afternoon. Each session was 20 minutes long and was divided into five minute periods during which each animal activity and species browsed were recorded to the nearest minute. Ten minute breaks between sessions were taken to facilitate switching of focal animals between observers so that, after the four sessions, each observer had observed all four animals.

Foliar sampling and analysis

The browsed and most abundant browse foliage were sampled by hand clipping and stored in shade before transportation to the laboratory where they were frozen until analysis for crude protein content.

Preference indices

The preference index for each browsed species was computed using the formula:

Preference index for species$_i$ (P_i)

= RD_i / RR_i

Where:

Relative frequency of species$_i$ in diet (RD_i)

= (Frequency of species in diet) /(Sum of all species frequencies in diet)

Relative frequency of species$_i$ on range (RR_i)

= (Frequency of species on range) / (Sum of all species frequencies on range)

The interpretation of the preference indices would be: an index of less than one signifies that the frequency of the species in the diet was less than the frequency on range, meaning that the goats did not have a high preference for such a species, despite its availability. A preference index of zero would be for species that were not browsed at all. An index of greater than one means that the species' frequency in the diet was greater than that on range, meaning that the species was highly preferred.

Results and Discussion

Range composition

Twenty eight browse species were recorded by the line intercept method. *Acacia karoo* had the highest occurrence frequency of 0.13, and the majority of species occurring at a relative frequency of less than 0.05.

Browse preference

The goats browsed thirty two species. This was more than the species sampled by the line intercept method, presumably because some of the species selected by goats had a trace occurrence on range. These trace species constituted 37.5 percent of species selected by the goats which spent 14 percent of their browsing time on these species. The correlation coefficient between species frequency in the diet and frequency on range was 0.6, suggesting that the goats were not preferentially selecting the species based on their availability alone.

Strychos cocculoides, a trace species, had the highest preference index of 6.1 (Table 1). Nine species or 28 percent of the species browsed had a preference index of greater than one and the goats spent 79 percent of their browsing time on these species. Of these highly preferred species, 30 percent had a trace occurrence on range. The animals therefore had a high preference for only a few of the species that were available. Sibanda (1986) similarly found that goats on Acacia thornveld spent most of their browsing time on a few browse species. Twenty five of the browse species on range, which had a cumulative relative frequency on range of 20 percent, were not consumed at all. This aversion could be due to plant anti-herbivory factors.

Table 1: Relative diet frequencies, relative range frequencies and preference indices of browsed species.

Browse species	Relative diet frequency	Relative range frequency	Preference Index
Strychos cucculoides	0.062	0.010	6.20
Dichrostachys cinerea	0.284	0.067	4.26
Acacia rehmanniana	0.088	0.027	3.31
Eurphobia matabelensis	0.044	0.013	3.27
Kirkia acuminata	0.028	0.010	2.77
Acacia karoo	0.227	0.133	1.70
Peltophorum africanum	0.015	0.010	1.53
Annona senegalensis	0.012	0.010	1.18
Albizia versicolor	0.046	0.040	1.14
Rhus tenuinervis	0.006	0.010	0.62
Carissa edulis	0.014	0.027	0.53
Lantana camara	0.011	0.027	0.40
Flacourtia indica	0.010	0.027	0.38
Pseudolachnospira	0.004	0.010	0.35
Stychnos innocua	0.004	0.010	0.35
Julbernadia globiflora	0.004	0.010	0.35
Brachystegia glaucescens	0.003	0.010	0.29
Ziziphus mucronata	0.002	0.010	0.18
Grewia Flavescens	0.140	0.080	0.18
Ficus capensis	0.002	0.010	0.18
Combretum molle	0.010	0.067	0.15
Securinega virosa	0.004	0.270	0.13
Diospyros mespiliformis	0.004	0.027	0.13
Gardenia volkensii	0.001	0.010	0.12
Maytenus heterophylo	0.001	0.040	0.03

Crude protein contents of sampled species ranged from 90g/kgDM to 150g/kgDM. The correlation coefficient between preference indices and crude protein content was 0.16, meaning that the goats' preference for the species was not necessarily linked to the crude protein content. This is in agreement with the findings of Cooper, Owen-Smith and Bryant (1988) who found no significant correlation between acceptability of browse to kudus and impalas and any single chemical factor. Msangi and Hardesty (1993), however, reported that crude protein content and availability of individual species appeared to influence selection by goats. Dube (1993) also reported a correlation coefficient of 0.8 between browse intake and available nitrogen. In Dube's work, however, the animals were not free ranging but were offered four browse species in the pen.

Conclusions and implications for management

This survey showed that although there is a wide variety of browse species available as potential feed for goats, only a few seem to be preferred. It is not only the selection of the browse species that is of importance to management but also their availability. The low frequency of occurrence of highly preferred species has management implications in that the animals could be spending a lot of energy in search of these species. It could also mean that if the species are continually heavily selected for, there

could be a danger of their availability and abundance being reduced on the rangelands, as was suggested by Sibanda (1986). This would be especially important if the grazing pressure on the rangelands is increased.

In terms of ensuring that the animals have access to their preferred browse, herding can be done in such a way that the animals have access to sites with such preferred species. More importantly, perhaps the "preference base" could be increased by the introduction of forage browse species which can be grown as domestic fodder by the farmers, as previously suggested by Sibanda (1986) and Msangi and Hardesty. (1993).

The information from this study could serve to establish predictors for site productivity by relating animal production to browse species composition. A threshold for low animal productivity could, for example be related to minimum abundance levels, intake levels and nutritive value of the most preferred species. Efforts should also be made to understand the plant and animal factors that may explain differential browse preferences. With this information it may be possible to predict animal performance from various plant communities.

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