

# **FEEDING BEHAVIOUR, PLANT SPECIES SELECTION AND *IN* SACCO RUMINAL DIGESTION IN TSWANA AND BOER GOATS**

**By**

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Submitted in partial fulfilment of the requirements  
for the degree of

Doctor of Philosophy (Ph. D)  
in the Department of Anatomy and Physiology  
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**May 2010**



## DECLARATION

I \_\_\_\_\_, hereby declare that the work contained in this thesis is entirely my own work with the exception of such quotations or references which have been attributed to their authors or sources.

Dated at \_\_\_\_\_ this \_\_\_\_\_ day of \_\_\_\_\_ 2010

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**Cornelia Kedidimetse Lebopa**

“Never underestimate God. He works in mysterious ways.  
He changes the times and seasons and gives wisdom to the wise and knowledge to those who have understanding” Daniel 2:21

## ACKNOWLEDGEMENTS

- ❖ The National Research Foundation (NRF) funded this project by means of a Grant Holder Bursary awarded through Prof. E. A. Boomker and also provided funds for research. Additional financial support was received in the form of a University of Pretoria Post Graduate Bursary as well as funding from the University of Pretoria's Research Committee. Skills Development Funding was also received from the North West University.

I wish to sincerely thank:

- ❖ Dr M van der Linde and Mr Paul van Staden for providing assistance with the design of the experiment and their invaluable assistance with the statistical analysis of the data.
- ❖ Dr Mulugeta and Dr Mokoboki for their assistance with statistical analysis and their patience and Mr Dube for helping with the final arrangement of the thesis.
- ❖ Dr G Harmse for the surgical procedures and Dr Cockroft for veterinary assistance with the study animals.
- ❖ Mr Wayne Truter for assisting with botanical surveys carried out at University of Pretoria.
- ❖ Messrs Ndlovu, Pepe, Sibanga and Nyanga for their valuable technical assistance with data collections and preparations of samples, as well as other staff members of the University of Fort Hare Research Farm for providing valuable technical assistance and facilities.
- ❖ Mr D Booyse for technical assistance and transporting animals from University of Pretoria to Fort Hare and Messrs Tshabalala and Wojani for the effective nursing and care of the fistulated animals.
- ❖ The Executive Dean of Agriculture at Fort Hare University, Prof. Raats for providing guidance and the necessary resources at the University of Fort Hare for me to pursue my dream.
- ❖ My Supervisors, Professors E. A. Boomker and M. Chimonyo, for their encouragement, support and guidance throughout my studies. I thank them for imparting their extensive knowledge and experience with me so that I can achieve my dream.

## **DEDICATION**

I dedicate this thesis to:

### **My husband and our kids**

My husband, Nicholas for being my pillar of strength, and our sons Thabang and Tumisho, and our daughter, Resegofaditswe. I thank you Darling for your love, support, patience, encouragement and allowing me to pursue my dream while you tirelessly looked after our kids.

You were the wind beneath my wings!

### **My mother and late sister**

My mother Mpho Mogorosi, for doing such an excellent job raising me with unconditional love, instilling in me morals, ethics, perseverance, love and respect and giving me a gift of life which is education. My late sister Dukie and her children (Katlego, Tumelo, Rebaone) for believing in my potential. Dukie, I know you would have been so proud of me!

### **My mother in-law**

My mother in-law Anastacia, for your love and support and for looking after my family when I was busy with the research. Thank you for taking and looking after our baby Tumisho so that I can finish this degree. You are the best mother in-law I could have ever asked for!

### **My brothers and sisters in-law**

Lebopa (Kate, Geoffrey, Glen, Vusi, Matome) and Malaka (Elisa, Rofhiwa, Rudzi, Shadi, Mashudu, Pascalis, Thato, Nthabiseng) families for their love, support and encouragement and for availing themselves when I needed help with the kids.

**You have all contributed enormously to my success, and I thank you.**

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## ABBREVIATIONS

ADF	-	acid detergent fibre
ADL	-	acid detergent lignin
BW	-	body weight
CP	-	crude protein
CPD	-	crude protein degradability
DM	-	dry matter
DMD	-	dry matter degradability
DMI	-	dry matter intake
GBD/ha	-	goat browsing day/ha
N	-	nitrogen
NDF	-	neutral detergent fibre

## ABSTRACT

The first experiment of this study was aimed at investigating the factors affecting the feeding behaviour and plant species selection of 3 free ranging Tswana (mean weight  $\pm$  37 kg) and 3 Boer (mean weight  $\pm$  36 kg) goat does in the False Thornveld of the Eastern Cape Province, South Africa. The feeding behaviour and plant species selection was observed and recorded during winter (cold-dry season) and summer (hot-wet season). Observations included the following categories: browsing, grazing and non-feeding activities. Non-feeding activities (NFA) include separate recordings of walking, standing, lying and drinking. Results showed goats spent 21.9 %, 44.65 % and 33.3 % of their day on browsing, grazing and non-feeding activities. Grass was clearly the preferred feed for goats both in the cold-dry season (54 %) and the hot-wet season (76 %) while browse consumption was higher in the cold-dry season (46 %) and lower in the hot-wet season (24 %). Goats spent more time on NFA in the cold-dry season (68.8 %) than the hot-wet season (31.9 %). Though diurnal variations were observed for both breeds and seasons in terms of browsing and non-feeding activities, no diurnal variations were found between the breeds.

Goats selected a wide spectrum of woody-plant species. A total of thirteen woody plant species were encountered and selected by goats in the range. *Scutia myrtina* was the most frequently consumed (29.9 %) woody plant species in the range followed by *Rhus refracta* (16.3 %), *Grewia occidentalis* (14.0 %), *Olea africana* (10.8 %). These four woody-plant species accounted for 71 % of the woody plant selection by goats. Significant differences ( $P < 0.001$ ) were found in percentage time spent selecting the different woody-plant species by goats. The frequency of woody-plant species selection was higher in the cold-dry season than the hot-wet season. Woody-plant selection was higher in the morning followed by the afternoon and lower during midday. Percentage time spent by goats selecting woody plant species decreased with advancing period of occupation of a grazing/browsing camp. Browse was the preferred feed when feed availability was high, but when feed availability declined, the goats decreased their frequency of woody-plant selection and more grass was eaten.

The second experiment was aimed at determining and comparing the nutritive value of forages selected by the same free ranging goats. Three (3) Tswana and 3 Boer goats equipped with remote controlled fistula valves were studied. Fistula valve samples were collected for 15 minutes during the day at 6 different times. All extrusa samples were kept on ice in the field and then stored in a



deep freeze prior to drying and milling. Each sample was freeze-dried and hand separated into bush (woody species) and grass components (including forbs). These samples were analysed for nitrogen (N), neutral detergent fibre (NDF), acid detergent fibre (ADF) and acid detergent lignin (ADL). The diets selected by the goats differed in CP (cold-dry season:  $5.39 \% \pm 0.15$  and hot-wet season  $9.48 \% \pm 0.15$ ;  $P=0.001$ ), NDF (cold-dry season  $48.09 \% \pm 1.02$  and hot-wet season  $53.76 \% \pm 1.02$ ;  $P=0.001$ ) and ADF (cold-dry season  $34.32 \% \pm 0.72$  and hot-wet season  $37.50 \% \pm 0.72$ ) between the seasons, but the ADF content showed no change (cold-dry season  $18.01 \% \pm 0.52$  and hot-wet season  $19.49 \% \pm 0.52$   $P>0.05$ ). Goats selected diets higher in CP, NDF and ADF during hot-wet season compared to cold-dry season. Generally, there were diurnal variations in the NDF ( $P=0.04$ ), ADF ( $P=0.02$ ) and ADL ( $P=0.01$ ) contents of forages selected by goats. Nutrient content of selected diets decreased in quality with advancing period of occupation of a camp. Knowledge of the nutritive value of the diet as selected by these animals is of primary importance in estimating the productivity of any rangeland.

The third experiment was aimed at determining *in sacco* dry matter (DM) and crude protein degradation of woody plant species incubated in the rumen of Tswana and Boer goats. The ruminal degradability of the three most selected woody plant species by goats during the cold-dry season (*G. occidentalis*, *O. africana* and *S. myrtina*) and the hot-wet season (*A. karroo*, *R. refracta* and *S. myrtina*), were measured *in situ*, using *in sacco* digestion techniques. The nylon bag incubation revealed large differences in the rumen degradability of DM of the three woody plant species during both cold-dry season and hot-wet season. Ruminal degradation constants ( $a$ ,  $b$  and  $a+b$  and  $c$ ) varied significantly ( $P<0.001$ ) between breeds and between goats within a breed. Thus, no breed difference in *in sacco* degradation of DM and CP was found between Tswana and Boer goats. There was a strong positive correlation between DMD, CPD and time of incubation in the rumen. The crude protein content of the woody plant species positively influenced the rumen digestion of dry matter because when CP increased DMD also increased. Both species preference and degradability of plant species are needed to estimate range suitability for browsing animals.

Results from this study will help to develop strategies to optimise range resources for sustainable animal production. In order to improve production, the constraints limiting success should be identified. Tswana goats might be a more favoured breed in semi-arid savannah because of their smaller body size, absolute nutrient requirement and better reproductive performance when

compared to Boer goats. However, when forage availability is not a limiting factor, Boer goats might yield better returns for the investment since they are superior in meat production.