# Dry matter production, intake and nutritive value of certain *Indigofera* species

**by**

**TLOU JULIUS TJELELE**

**SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE**

**M. Inst. Agrar. (Animal Production)**

**DEPARTMENT OF ANIMAL AND WILDLIFE SCIENCES**
**FACULTY OF NATURAL AND AGRICULTURAL SCIENCES**

**UNIVERSITY OF PRETORIA**
**PRETORIA**

**June 2006**

**DECLARATION**

I, Tlou Julius Tjelele, declare that this dissertation, for the degree M. Inst. Agrar. (Animal Production) at the University of Pretoria, has not been submitted by me for a degree at any other University.

……

T.J Tjelele

Pretoria

# SUMMARY OF CONTENTS

**CHAPTER 2**



**CHAPTER 3**

## ACKNOWLEDGEMENTS

My sincere appreciation goes to the following who made this study a success:

- My study leader; Prof. W.A Van Niekerk for his guidance, mentorship and suggestions.
- Prof. N.F.G Rethman; Co-study leader for his advice and encouragement.
- Mrs. M. Trytsman (ARC-RFI) for her personal support and encouragement throughout this project.
- Mr. Abubeker Hassan (PhD. Student); for his assistance with the field trial
- Mr. R.J Coertze for help with the statistical analysis
- The Agricultural Research Council (RFI) and University of Pretoria for financial assistance.
- Mrs. E. Ferreira and her team with the laboratory analysis.
- My parents, uncle and his wife, brother and friend (Louisa Matoane) for their unwavering support and patience.
- Mr. Jan Manganye and his team (ARC, RFI) for their technical assistance.
- My God and Savior for wisdom, strength, courage and grace to study.

# ABSTRACT

## Dry matter production, intake and nutritive value of certain *Indigofera* species

**by**

**T.J Tjelele**

**Study leader:** **Prof. W. A Van Niekerk**
**Co-leader:** **Prof. N.F.G Rethman**
**Department:** **Animal and Wildlife Sciences**
**Faculty of Natural and Agricultural Sciences**
**University of Pretoria**
**Pretoria**
**Degree:** **M. Inst. Agrar. (Animal Production)**

The objective of the study was to evaluate the dry matter production, intake and the nutritive value of *Indigofera* species. The dry matter yield, leaf:stem ratio, chemical composition, voluntary intake and digestibility of *Indigofera* species were determined. The leaves as well as the leaves and stems (<3mm) of five different *Indigofera* species (*I. amorphoides*, *I. cryptantha*, *I. costata*, *I. viciodes* and *I. arrecta*) were harvested. There was a greater total dry matter yield during autumn 2004 from *I. amorphoides*. However, no significant differences were obtained between all the species over the seasons.

There were significant differences between all the species in autumn with a lower proportion of leaves than in spring, except for *I. arrecta*, which had the same leaf: stem ratio in both seasons. During spring, *I. amorphoides* and *I. cryptantha* generally had a higher proportion of leaf material than other species. There were significant differences between all the species for the leaves as well as leaves and stems (<3mm) as a result of advancing maturity and decrease in leaf: stem ratio with respect to ash, crude protein (CP), neutral detergent fibre (NDF) concentration and *in vitro*

digestibility of organic matter (IVDOM). Despite a decrease in leaf: stem ratio, all the species had an adequate CP concentration for optimal animal production. All the minerals (macro and micro elements) found in this study, in both years, will satisfy the nutrient requirements of sheep. However, all mineral elements in this study appeared to decrease with ageing of the plants and decline in leaf: stem ratio, except for Mn concentration, which increased with ageing of the plants.

Lucerne, which was used during the intake study as a control, had a significantly higher organic matter intake (OMI) and digestible organic matter intake (DOMI) than *Indigofera* species and *Leucaena leucocephala*. However, there were no significant differences between *Indigofera* species and *L. leucocephala*. Intake levels in this study for *L. leucocephala* and *Indigofera* species would be insufficient for maintenance requirements of grazing sheep. The relatively lower IVDOM for *Indigofera* species and *L. leucocephala* compared to that of lucerne was because of a higher NDF concentration. Despite the relatively high NDF concentration, *Indigofera* species appeared to be a good fodder because of its high CP and Ca, P, Mg, Cu, Zn and Mn concentrations.

# UITTREKSEL

## Droë materiaal produksie, inname en voedingswaarde van sekere *Indigofera* species

**deur**

**T.J Tjelele**

| | |
|---|---|
| **Studieleier:** | **Prof. W.A Van Niekerk** |
| **Medeleier:** | **Prof. N.F.G Rethman** |
| **Departement:** | **Vee- en Wildkunde** |
| | **Fakulteit Natuur- en Landbouwetenskappe** |
| | **Universiteit van Pretoria** |
| | **Pretoria** |
| **Graad:** | **M. Inst. Agrar. (Animal Production)** |

Die doel van die studie was om die droë materiaal produksie, inname en die voedingswaarde van *Indigofera* spesies te ondersoek. Die droë material opbrengs, blaar:stam verhouding, chemiese samestelling en verteerbaarheid van *Indigofer*a spesies is bepaal. Die blare sowel as die stamme (<3mm) van vyf verskillende *Indigofera* spesies (*I. amorphoides, I. cryptantha, I. costata, I. viciodes and I. arrecta*) is geoes. ‘n Hoër totale droë material opbrengs is van *I. amorphoides* gedurende herfs 2004 geoes. Geen betekenisvolle verskille is egter tussen die spesies vir die verskillende seisoene aangeteken nie.

Daar was betekenisvolle verskille tussen al die spesies in herfs met ‘n laer blaar verhouding as in die lente, uitgesonderd *I. arrecta* wat dieselfde blaar:stam verhouding in beide seisoene gehad het. Gedurende die lente het *I. amorphoides* en *I. cryptantha* oor die algemeen ‘n hoër verhouding blaar material as die ander spesies getoon. Daar was betekenisvolle verskille tussen al die spesies vir die blare sowel as die blare en stamme (<3mm) weens volwasse wording en die afname in blaar:stam verhouding met verwysing na as, ruproteïen (RP), neutraal bestande vesel (NDF)

konsentrasie en *in vitro* verteerbaarheid van organiese materiaal (IVVOM). Ten spyte van ‘n afname in blaar: stam verhouding het al die spesies voldoende RP konsentrasies vir optimale diereproduksie getoon. Beide die makro- en mikro-elemente vir beide jare, sal aan die voedingsbehoeftes van skape voldoen. Alle minerale elemente wat in die studie geanaliseer is, se konsentrasie het verlaag soos die plante verouder het en soos die blaar:stam verhouding afgeneem het, behalwe vir die Mn- konsentrasie wat met veroudering verhoog het.

*Medicago sativa*, wat as ‘n kontrole in die inname proef gebruik is, het ‘n betekenisvolle hoër organiese material inname (OMI) en verteerbare organiese material inname (VOMI) as die *Indigofera* spesies en *Leucaena leucocephala* getoon. Daar was egter geen betekenisvolle verskille tussen die *Indigofera* spesies en *L. leucocephala* nie. Inname van *L. leucocephala* en die *Indigofera* spesies was onvoldoende vir onderhoud van skape. Die relatiewe laer IVVOM van die *Indigofera* spesies en *L. leucocephala*, in vergelyking met lusern, kan toegeskryf word aan die hoër NDF konsentrasies in eersgenoemde. Ten spyte van die relatiewe hoë NDF konsentrasie blyk dit asof die *Indigofera* spesies ‘n goeie ruvoer is aangesien dit beskik oor hoë RP sowel as hoë Ca, P, Mg, Cu, Zn en Mn konsentrasies.

## LIST OF TABLES