

ACKNOWLEDGEMENTS

My sincere appreciation and gratitude go to the following people who made this study possible:

My study leader, Prof H. H. Meissner for his encouragement, advice and friendship.

Prof N. P. (ONOBRYCHIS VICIIFOLIA), SHEEPS' BURNET (SANGUISORBA MINOR) AND LUCERNE (MEDICAGO SATIVA).

Prof H. T. Groeneveld of the Department of Statistics for his help with the statistical analysis.

The Head of the Department of Animal Science, Prof Cas Maree for his friendly words of encouragement.

Mr Bertus Spreeth for his assistance with the laboratory analysis.

Miss Lynn du Toit for her assistance with the tannin analysis.

Miss Merida Spoor for her assistance with the laboratory analysis.

Messrs. Frans Malope and ... for their assistance with the trials.

The Director of the Department of Agricultural Sciences

UNIVERSITY OF PRETORIA

Development, the University of Pretoria and South African

Motor Corporation for their assistance for this study.

My wife, Nokolo, for her unwavering support and encouragement.

OCTOBER 1991



ACHAMPONG - BOATENG

ACKNOWLEDGEMENTS

My sincere appreciation and gratitude go to the following people who made this study possible:

My study leader, Prof H. H. Meissner for his encouragement, advice and suggestions, moral support and friendship.

Prof N. F. G. Rethman, the co-study leader especially for his help with the management of the experimental pastures and final advice on the script.

Prof H. T. Groeneveld of the Department of Statistics for his help with the statistical analysis.

The Head of the Department of Animal Science, Prof Cas Maree for his friendly words of encouragement.

Mr Bertus Spreeth for his help with the laboratory analysis.

Miss Lynn du Toit for her assistance with the tannin analysis.

Miss Merida Smuts for kindly typing the script.

Messrs. Frans Malope and Nicholas Malemaja for their assistance with the trials.

The Director, Grassland Research Centre, Department of Agricultural Development, the Foundation for Research Development, the University of Pretoria and South African Motor Corporation for financial assistance for this study.

My wife, Noxolo, for her unwavering support and encouragement.

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I declare that this dissertation is my own work. It is being submitted for the degree of Master of Science in the University of Pretoria. It has not been submitted before for any degree or examination at any other university.

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sheep's burnet using lucerne as a reference or control. The following indices of nutritive value determined on pasture or with sheep were employed: dry matter (DM) yield and leaf to stem ratios, chemical composition, digestibility and voluntary intake of organic matter (OM) of the forage, post-ruminal disappearance of non-ammonia nitrogen (NAN) and degradation of the forage proteins in the rumen of sheep.

The study was conducted in two phases with Phase I covering mid-summer to mid-autumn and with only sainfoin and sheep's burnet as treatments. Phase II covered late autumn to early summer with lucerne included as a treatment.

ABSTRACT

There were no significant differences in DM yield of sainfoin and sheep's burnet in Phase I, whereas both sainfoin and sheep's burnet had significantly higher yields. The nutritive value of sainfoin (Onobrychis viciifolia), sheep's burnet (Sanguisorba minor) and lucerne (Medicago sativa), with sainfoin generally having a higher proportion of leaf material followed by lucerne and sheep's burnet in that order.

by

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Department : Livestock Science

Degree product : M.Sc. (Agric)

The aim was to assess the nutritive value of sainfoin and sheep's burnet using lucerne as a reference or control. The following indices of nutritive value determined on pasture or with sheep were employed: dry matter (DM) yield and leaf to stem ratios, chemical composition, digestibility and voluntary intake of organic matter (OM) of the forages, post-ruminal disappearance of non-ammonia nitrogen (NAN) and degradation of the forage proteins in the rumen of sheep.

The study was conducted in two phases with Phase I covering mid-summer to mid-autumn and with only sainfoin and sheep's burnet as treatments. Phase II covered late autumn to early summer with lucerne included as a treatment.

There were no significant ($P \leq 0,05$) differences in DM yield of sainfoin and sheep's burnet in Phase I, whereas both sainfoin and sheep's burnet had significantly higher yields than lucerne in Phase II. There were significant differences in leaf to stem ratios between the three forages in both phases with sainfoin generally having a higher proportion of leaf material followed by lucerne and sheep's burnet in that order.

There were significant differences between the three pastures in both phases with respect to crude protein (CP), acid detergent fibre (ADF) and neutral detergent fibre (NDF). However, all three forages contained adequate CP for animal production purposes. Sainfoin had considerably higher lignin contents compared to the other two forages. Calcium, P and Mg contents in the three pastures exceeded the optimum values quoted in the literature.

There were significant differences in OM digestibility between the three pastures in both phases with lucerne having the highest digestibility, followed by sheep's burnet and sainfoin in that order. There were no significant

differences in the intake of OM by sheep between sainfoin and sheep's burnet in Phase I. In Phase II, however, there was a significantly higher OM intake on sainfoin compared to sheep's burnet and lucerne which did not differ significantly from each other.

There were significant differences in NAN disappearance in the small intestine of sheep in both phases with sainfoin having the highest disappearance followed by sheep's burnet and lucerne in that order. There were also significant differences in the digestibility of NAN postruminally in both phases with sainfoin having a higher digestibility than sheep's burnet in Phases I and II but not differing significantly from lucerne in Phase II. Sheep's burnet had a significantly lower NAN digestibility than lucerne.

Incubation of samples of the forages in nylon bags in the rumen resulted in significant differences in predicted degradation of feed crude protein with lucerne having the highest degradation, followed by sainfoin and sheep's burnet in that order. An analysis for tannins confirmed the presence of condensed tannins in sainfoin and most probably hydrolysable tannins in sheep's burnet. This probably accounted for the low crude protein degradation of the two pastures in the rumen and the higher availability and disappearance of NAN in the small intestine.

SAMEVATTING

Die voedingswaarde van sainfoin (Onobrychis viciifolia), skaapburnet (Sanguisorba minor) en lusern (Medicago sativa).

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Die doel van die ondersoek was om die voedingswaarde van sainfoin en skaapburnet te bepaal deur lusern as verwysing of kontrole te gebruik. Die parameters van voedingswaarde wat op die weidings en met skape bepaal is, is droë materiaal (DM) opbrengs, blaar tot stingel verhouding, chemiese samestelling, verteerbaarheid en vrywillige inname van die organiese materiaal (OM) van die gewasse, verdwyning van nie-ammoniak-stikstof (NAN) in die laer spysverteringskanaal en degradeering van gewasproteïen in die rumens van skape.

Die studie is in twee fases uitgevoer. Fase I is van toepassing op middel-somer tot middel-herfs, met slegs sainfoin en skaapburnet as behandelings. Fase II het laat herfs tot vroeë somer gedek, hierdie keer met lusern ingesluit.

Geen betekenisvolle verskille ($p \leq 0,05$) is in DM opbrengs tussen sainfoin en skaapburnet vir Fase I gevind nie. Daar was wel in Fase II betekenisvolle verskille, met sainfoin en skaapburnet wat groter opbrengste gelewer het as lusern. Daar was betekenisvolle verskille in blaar tot stingel verhouding tussen die drie gewasse in albei fases, waar sainfoin oor die algemeen 'n hoër proporsie blaarmateriaal gehad het, gevolg deur lusern en skaapburnet met die kleinste verhouding.

Die drie gewasse het in albei fases betekenisvolle verskille getoon met betrekking tot ruproteïen (RP), suurbestande vesel (SBV) en neutraalbestande vesel (NBV). Alle gewasse het voldoende RP waardes vir diereproduksie getoon. Sainfoin het heelwat meer lignien gehad in vergelyking met die ander twee gewasse. Volgens die literatuur was Ca-, P- en Mg-inhoud van alle gewasse deurgaans hoër as behoefte.

Daar was betekenisvolle verskille tussen die OM verteerbaarhede van al drie gewasse in albei fases. Lusern het die hoogste verteerbaarheid gehad gevolg deur skaapburnet en dan sainfoin. In Fase I was daar tussen sainfoin en skaapburnet geen betekenisvolle verskille met betrekking tot OM inname nie. Daar was wel in Fase II 'n betekenisvol hoër OM inname vir sainfoin in vergelyking met skaapburnet en lusern. Laasgenoemde twee gewasse het nie betekenisvol van mekaar verskil nie.

Sainfoin het betekenisvol hoër NAN verdwyning in die laer spysverteringskanaal van skape in albei fases gehad, gevolg deur

skaapburnet en lusern, in dié volgorde. Die verteerbaarheid van NAN in die laer spysverteringskanaal het ook betekenisvol verskil in albei fases. Sainfoin het 'n hoër NAN verteerbaarheid as skaapburnet in albei fases gehad, maar die verteerbaarheid het nie betekenisvol van lusern in die tweede fase verskil nie. Die NAN verteerbaarheid van skaapburnet was betekenisvol laer as dié van lusern.

Inkubasie van die gewasse in nylonsakkies in die rumen het betekenisvolle verskille met betrekking tot voorspelde degradeering opgelewer. Lusern het die hoogste degradeering gehad, gevolg deur sainfoin en dan skaapburnet. 'n Analise vir tanniene het die teenwoordigheid van gekondenseerde tanniene in sainfoin bevestig. Hidroliseerbare tanniene is waarskynlik in skaapburnet teenwoordig. Hierdie tanniene het waarskynlik aanleiding gegee tot die lae degradeering in die rumen van sainfoin en skaapburnet asook die hoër beskikbaarheid en verdwyning van NAN in die dunderm.