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Prairie Grass Pastures : Studies of Their Composition and Feeding Value for Milk Production

**A thesis presented in partial fulfilment
of the requirements for the degree of
Doctor of Philosophy
in Animal Science
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(B.Sc., M.Sc., Dip. Agric.)

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D e d i c a t i o n

To my wife *Margaret Kironde* who took care of the children and provided the final inspiration towards the completion of this work.

**PRAIRIE GRASS PASTURES : STUDIES OF THEIR COMPOSITION
AND FEEDING VALUE FOR MILK PRODUCTION**

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A B S T R A C T

Two experiments were carried out to examine the effects of differences in pre-grazing herbage mass of prairie grass (*Bromus willdenowii* Kunth) cv. Grasslands Matua pastures on herbage composition in summer, autumn, winter and spring (Experiment 1); and herbage composition and milk production by grazing cows during eight short-term (2-3 weeks) grazing trials in early spring, late spring, summer and autumn over two years (Experiment 2).

Swards with low (LM), intermediate (IM) and high (HM) (Experiment 1), and with LM and HM (Experiment 2) pre-grazing herbage mass were created and maintained by differential grazing. Simultaneous comparisons were made with conventional perennial ryegrass/white clover (RG) swards (Experiment 2). Prairie grass swards were grown with red clover (Experiment 1) or white clover (Experiment 2). Cows were given a common nominal herbage allowance of 50 kg DM/cow daily (Experiment 2). The LM swards were topped mechanically when required (Experiment 2). Mean pre-grazing and residual herbage masses (t DM/ha) were, respectively;

Experiment 1: LM, 4.4 and 1.9; IM, 6.5 and 2.6; HM, 6.7 and 3.5 ;

Experiment 2: RG, 3.2 and 2.1; LM, 4.2 and 2.2; HM, 5.7 and 3.6.

In Experiment 1, the low mass swards contained lower concentrations of stem and dead matter, but higher concentrations of leaf than the intermediate or high mass swards; the concentrations of clover in the three sward types were similar. Herbage from the low mass sward type was also more digestible, and contained greater concentrations of nitrogen.

In Experiment 2, the ryegrass swards contained greater mean proportions of leaf and smaller proportions of stem and senescent material than the two prairie grass sward types, which contained similar proportions of stem; low mass prairie grass swards contained

greater and smaller proportions of leaf and senescent matter, respectively, than high mass swards. The proportion of clover was smaller in high mass prairie grass swards than ryegrass or low mass prairie grass swards, which contained similar proportions; that of unsown species was generally highest in low mass prairie grass swards. The proportion of prairie grass, tiller density and weight per tiller decreased over time in both prairie grass swards, but the decrease was faster in the low mass swards.

Herbage from the ryegrass swards was more digestible and had a greater concentration of nitrogen than the high mass prairie grass swards, while the low mass prairie grass swards showed intermediate values. There were only small actual differences between treatments in the digestibility and nitrogen concentrations of whole plants, leaf or stem, but values were generally lower in the high mass prairie grass swards; the digestibility of dead matter was very low (OMD < 48%) and was much lower in prairie grass swards. It appears that the high proportion of dead matter was largely responsible for the decrease in the quality of herbage from prairie grass swards, while the high proportion of stem was not important in this respect.

Apparent herbage intakes by cows from the three sward types were relatively high, but yields of milk and milk solids were smallest from cows grazing the high mass prairie grass swards. Yields of milk and milk solids from ryegrass and low mass prairie grass swards were similar in all periods, except in summer when yields were smaller from low mass prairie grass swards.

There were season x sward type interactions for herbage component concentrations, herbage digestibility, and milk production. However, the data were consistent in showing that high mass swards always contained lower proportions of green leaf and greater proportions of senescent matter; the digestibility and feeding value of the herbage, and milk production from the high mass swards were lower when compared with low mass swards, most probably due to smaller intakes of digestible nutrients from the former swards.

It was concluded that the feeding value for milk production of prairie grass swards maintained at low herbage masses was similar to that of conventional ryegrass swards, except during the summer period when that of low mass prairie grass was lower; but low mass prairie grass swards were less persistent, despite long grazing intervals of 5-6 weeks.

Suggestions were made for further research.

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A B B R E V I A T I O N S

ADF	:	Acid detergent fiber
d	:	day
DM	:	dry matter
DMD	:	digestibility of dry matter
DMI	:	dry matter intake
DOMA	:	digestible organic matter allowance
DOM(D)	:	digestible organic matter (in the dry matter)
GHA	:	green herbage accumulation
GMA	:	green matter allowance
GT	:	grazing time
HA	:	herbage allowance
HM	:	high herbage mass
hr	:	hour
IB	:	intake per bite
IM	:	intermediate herbage mass
LAI	:	leaf area index
LM	:	low herbage mass
ME	:	metabolisable energy
N	:	nitrogen
n	:	number
NA	:	not analysed statistically; not applicable
NHA	:	net herbage accumulation
NHP	:	net herbage production
NS	:	not statistically significant
OM	:	organic matter
OMA	:	organic matter allowance
OMD	:	digestibility of organic matter
pers. com	:	personal communication
PHM	:	pre-grazing herbage mass
PSH	:	pre-grazing sward surface height
RB	:	rate of bite
RG	:	perennial ryegrass
RHM	:	residual (post-grazing) herbage mass
RSH	:	residual (post-grazing) sward surface height
SD	:	standard deviation
t	:	tonne
Sign.	:	significance level
VFI	:	voluntary feed intake
Yr	:	year

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