

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

Studies of grazing behaviour
by lactating cows during
winter, spring and summer

A thesis presented in partial fulfilment of the
requirements for the degree of

Master of Applied Science
in
Animal Science

at Massey University, Palmerston North
New Zealand

Lisa A. Watson

1999

Abstract

The work outlined in this thesis was intended to study the grazing behaviour of lactating cows during winter, spring and early summer, and the effects of maize silage supplementation during winter. It also derived monthly rising plate meter equations over the period of the experiments, in order to assist with the estimation of cow intake and sward characteristics.

Supplementation influenced the quantity and relative proportions of grazing, ruminating and idling times. Total grazing times were 546 vs. 615-min./day, and total rumination times 403 vs. 333-min./day for supplemented and non-supplemented cows respectively. Substitution of pasture for maize silage occurred, with reductions in grazing time averaging 26-minutes per kg DM eaten as maize silage. Rumination values per kg of total DM eaten were similar at 29-minutes (supplemented) and 27-minutes (non-supplemented). Intake rate of pasture was not affected by offering maize silage as a supplement, but grazing time was reduced.

Cows preferred to graze during daylight hours, spending 47-57% of daylight hours grazing irrespective of daylength. Grazing activity peaked after milkings, and before dusk.

Autumn and spring calved cows were grazed together in two experiments in the spring and summer of 1998. Stage of lactation had no effect on bite rate, bite weight, and intake rate of herbage. Grazing times were related to metabolic requirements, and grazing behaviour was similar for cows which had calved in autumn or in spring.

Times for ruminating and grazing were similar for heifers and mature cows, with similar components of day and night-time grazing. Heifers have a lower intake rate (23 vs. 27-g DM/min), and smaller bite weights (423 vs. 507-mg DM/bite) without a faster bite rate (58 vs. 56-bites/min). Heifers also ruminated for longer per kg DM eaten, with similar ruminating times to mature cows (380 vs. 380-min/cow/day), despite their smaller daily pasture intake (12.9 vs. 15.3-kg DM/cow). It is suggested that the grazing behaviour of heifers is influenced by social factors, such as their dominance position in a herd.

Monthly rising plate meter equations were derived between July 1998 and February 1999. When used to rank pastures for grazing order, the importance of the slope rather than the intercept was demonstrated. However when the rising plate meter was being used to compare pasture with required target values (such as average farm pasture cover, and post-grazing herbage mass), the intercept was also important, to give an accurate pasture mass value.

Acknowledgements

I am particularly grateful to Professor Colin Holmes for giving me the opportunity to study under his supervision. How he keeps everyone happy is beyond me, but the way post-grad students are prioritised is but a dream for many. The promptness of reviewing material making up this thesis is highly appreciated. He has always been available to talk to and takes an active interest in the person as well as the project.

Thanks to all my fellow postgrads. José García-Muñiz (Hosay) for his guidance in trial procedures and for all that inside information on the best way to do things! Sergio Garcia (Yani) for all the help and patience he showed me. Thank you Nicolas for the words of philosophical and practical help. My particular appreciation to Satish, Alastair, and Luis for taking me under their wing, and for all the support and encouragement they gave me. I have particularly enjoyed the humorous debates on a wide range of issues, usually initiated by Alastair for a break, and usually ceased by Alastair in frustration.

I'd like to thanks Geoff Purchas for his assistance with cutting all those calibration cuts, and even doing a bit of grass washing when I was busy winging my way to Australia. Thanks to Jo Lundman for the lend of 'her' platometer, and for all the fights with the computer to get the information I needed. Alastair MacDonald for the assistance in obtaining the information I needed, and for painting those cows in the rain. To the past and present Massey Number 1 dairy farm staff, especially Mike, Jo, John and Rick. The extra work I created for you was never an issue, and between us we kept all the cows going in the right direction.

My appreciation to Gerald Cosgrove (AgResearch) for being so receptive to my ideas, and for making it all possible.

Thanks to all those friends turned budding behaviour observationalists, and those who I hadn't met before, yet were will to give up their time and often sleep to watch cows. I bet it never occurred to many of you that such a thing would even be contemplated. We had a mixture of weather – but it was cold and wet for more than our fair share of it.

My gratitude to Patrick Morel for your statistical advice. No matter how busy you are, you always have time for all those poor students battling with the analysis of their data. There needs to be more of you.

Thanks to my parents for their patience and support. Yes, Lisa has finally left.

Finally, thanks to Michele and Jurriaan for opening their home to me for the last couple of months. Your support, encouragement, and humour have been much appreciated.

List of Abbreviations and Symbols

Abbreviations

ADF	Acid Detergent Fibre (NDF less hemicellulose i.e. cellulose and lignin)
a.m.	<i>ante meridiem</i>
ANOVA	analysis of variance
BR	bite rate
BS	bite size
BW	bite weight
CP	crude protein (Total Nitrogen \times 6.25)
DM	dry matter
h	hours
ha	hectares
lwt	live weight
ME	metabolisable energy (The gross energy in the feed less that lost in faecus, urine an
MF	milk fat
min.	minute
MJ	megajoule
MJME	megajoules of metabolisable energy
MS	milk solids
NDF	Neutral Detergent Fibre (cell wall materials e.g. hemicellulose, cellulose and lignin
OM	organic matter
P	probability
PGR	pasture growth rate
p.m.	<i>post meridiem</i>
PROC	procedure
RPM	rising plate meter
SAS	Statistical Analysis System
vs.	<i>versus</i>

Weights, volumes and measures

cm	centimetre
°C	degrees centigrade
kg	kilogram
l	litre
m	meter

Statistical terms

*	significant at $P < 0.05$
**	significant at $P < 0.01$
***	significant at $P < 0.001$
†	significant at $P < 0.1$
n	number
NS	not significant
R^2	coefficient of determination
s.e.d	standard error of the difference
SD	standard deviation
SE	standard error of the mean

Table of Contents

Abstract	i
Acknowledgements	iii
List of Abbreviations and Symbols	v
CHAPTER 1:	
Introduction to present research	1
CHAPTER 2:	
Seasonal behaviour of grazing dairy cattle, effects of season of calving, season of the year, and maturity of the pastures	45
CHAPTER 3:	
The investigation of grazing and eating behaviour of cows consuming pasture and maize silage in a commercial farm.	71
CHAPTER 4:	
Calibrations of the Rising Plate Meter; effects of season and irrigation	94
CHAPTER 5:	
General discussion	113
Appendices	129