

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.

A STUDY OF
THE DEFOLIATION PATTERN OF SHEEP
GRAZING PASTURE

A Thesis, presented in partial fulfilment of the
requirements for the degree of

Master of Agricultural Science

at

Massey University

Peter James McIvor

March, 1971

ACKNOWLEDGMENTS

I wish to especially thank Professor B. R. Watkin, my supervisor, for his helpful guidance and encouraging discussion during this study.

I am grateful to others who have helped; Mr R. F. Battersby for willing help in the field recording, Mr G. C. Arnold for statistical advice, Mr D. B. Edmond for discussion and criticism of the first draft of this thesis and Mr R.W.S. Leitch and the photographic department who reproduced the figures.

Finally my thanks to Mrs F. Smith for her careful typing of this thesis.

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
Acknowledgments.	
Introduction	1
Chapter I. Review of Literature.	
Animal Intake and Selectivity	3
Grazing Behaviour	4
The Grazing process	6
The Pattern of Defoliation	
A. Selectivity	7
B. Frequency and Intensity of Defoliation of individual Units	15
Chapter II. Experiment I.	
A. Introduction	21
B. Materials	22
C. Methods	23
D. Results	28
E. Discussion	47
Chapter III. Experiment II.	
A. Introduction	61
B. Materials	62
C. Methods	62
D. Results	64
E. Discussion	78
Chapter IV. General Discussion.	87
Summary.	97

Table of Contents (cont'd).

Bibliography

Appendix I

Appendix II

Appendix III.

LIST OF TABLES

<u>Table</u>	<u>Page</u>
Chapter I.	
I.1. A comparison of the severity of defoliation with stocking rate and grazing pressure (modified after Hodgson and Ollerenshaw, 1969).	17
Chapter II. Experiment I.	
II.1. Stocking rates	23
II.2. Mean daily growth rates (kgs/ha/day)	31
II.3. Botanical composition (% dry matter)	32
II.4. Mean heights (mm) and green leaf lengths (G.L.L.) of tillers (mm).	34
II.5. Tillers counts (numbers/m ²)	35
II.6. Mean weekly loss of tillers by uprooting from 15 April to 12 May (numbers/m ²).	35
II.7. Liveweight changes of ewes (kgs)	36
II.8. Grazing times (hrs/day)	37
II.9. Reasons for loss of tiller records, and losses in each category	38
II.10. Frequency of defoliation (days between defoliations)	39
II.11. Mean green leaf length and height (cm) of grazed and ungrazed tillers before grazing	40
II.12. Subsequent defoliations of tillers previously grazed or ungrazed	41
II.13. Severity of defoliation of individual tillers as length of G.L.L. (mm) and as percentage of G.L.L. removed (%).	43
II.14 (a). Frequency of defoliation of "old", "young" and "youngest" tillers (days between defoliations).	44
(b). Severity of defoliation of "old", "young" and "youngest" tillers (% G.L.L. removed per defoliation)	44

List of Tables (cont'd).

II.15. Variation in some animal and pasture parameters and their inter-relationships	53
II.16. Mean G.L.L. of "old", "young" and "youngest" tillers (cm).	58
Chapter III. Experiment II.	
III.1. Mean daily growth rates (Kgs/ha/day)	64
III.2. Botanical composition (% dry matter)	68
III.3. Mean heights (mm) and green leaf length (G.L.L.) of tillers (mm).	68
III.4. Tillers counts (number/m ²)	69
III.5. Liveweights changes of wethers (Kgs)	70
III.6. Reasons for loss of tillers records, and losses in each category	71
III.7. Frequency of defoliation (days between defoliations)	71
III.8. Mean green leaf length and height (cm) of grazed and ungrazed tillers before defoliation	72
III.9. Subsequent defoliations during period I of tillers grazed or ungrazed prior to July 10.	73
III.10. Severity of defoliation of individual tillers as length of G.L.L. (mm) and as percentage of G.L.L. removed (%)	73
III.11(a). Frequency of defoliation of "old", and "young" tillers (days between defoliations)	76
(b). Severity of defoliation of "old" and "young" tillers (% G.L.L. removed per defoliation)	76
III.12. Mean G.L.L. of "old" and "young" tillers (cm).	83

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
Chapter I.	
I.1. Relation of rate of herbage intake, rate of biting and size of bite to length of tiller (after Allden and Whittaker, 1970).	5
Chapter II. Experiment I.	
II.1. Changes in total dry matter available (Kgs/ha)	28
II.2. Changes in mean height and green leaf length (G.L.L.) of sward (mm).	33
II.3. Severity of defoliation of individual tillers (A) Mean G.L.L. (mm) removed and (B) % G.L.L. removed at a single defoliation	42
II.4. Pattern of leaf selection on tillers	46
Chapter III. Experiment II.	
III.1. Changes in total dry matter available (Kgs/ha)	65
III.2. Changes in mean height and green leaf length (G.L.L.) of sward (mm)	66
III.3. Severity of defoliation of individual tillers (A) Mean G.L.L. (mm) removed, and (B) % G.L.L. removed at a single defoliation	74
III.4. Pattern of leaf selection on tillers	77

LIST OF PLATES

<u>Plate</u>		<u>Page</u>
1.	View of plots showing transect in position and grouped markers beneath the transect line.	25
2.	General and close-up view of the pastures prior to commencement of Experiment I.	29
3.	Close-up view of the "medium stocked" and "high stocked" pastures at the end of Experiment I.	30
4.	General view of site of Experiment II and close-up of "merino" pasture at commencement of grazing showing patch grazing.	67
5.	Development of the "dung patch" grazing effect on the "merino" pastures after 3 weeks and after 6 weeks.	84