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A STUDY OF THE REACTION  
OF  
FOUR GRASS SPECIES  
PERENNIAL RYEGRASS (LOLIUM PERENNE L.)  
TIMOTHY (PHLEUM PRAEENSE L.)  
COCKSFOOT (DACTYLIS GLOMERATA L.)  
AND  
BROWNTOP (AGROSTIS TENUIS SIBTH.)  
TO AN ARTIFICIAL TREADING TREATMENT

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TABLE OF CONTENTS

<u>CHAPTER</u>		<u>Page</u>
I	INTRODUCTION	1
II	REVIEW OF LITERATURE	4
	The Recognition of the Treading Effect	5
	The Influence of the Animal on the Treading Effect	7
	The Effects of Sheep Treading on Plant and Soil	13
	Sheep Treading Studies and Pasture Yield	34
III	MATERIALS AND METHODS	37
	The Development of the Artificial Hoof	38
	The Experiment	41
	A Description of the Area used, Layout and Establish- ment of Plots, and the Application of Treatments	42
	Sampling Methods and Experimental Techniques	46
IV	RESULTS AND DISCUSSIONS OF THE AUTUMN TRIAL	50
	PART I RESULTS	
	A. The artificial treading treatment	51
	B. Statistical Techniques	51
	C. The dry weight yield of each species	51
	D. Tiller counts	55
	E. The dry weight yield of other species	57
	F. The dry weight yield of <u>Poa spp.</u>	61
	G. Growing point measurements	61
	H. Soil moisture data	63
	I. Bulk density measurements at three depths	63
	PART II DISCUSSIONS	66
V	RESULTS AND DISCUSSIONS OF THE SPRING TRIAL	76
	PART I INTRODUCTION	77
	PART II RESULTS	78
	A. The artificial treading treatment	78
	B. The dry weight yield of each species	78
	C. Tiller counts	80
	D. Growing point measurements	83
	E. Soil Moisture data	87
	F. Bulk density measurements at four depths	87
	PART III DISCUSSION	90
VI	GENERAL DISCUSSION	96
VII	SUMMARY	98
	Bibliography	
	Acknowledgments	
	Appendices	

LIST OF FIGURES

<u>Figure</u>	<u>Facing Page</u>
1. The Artificial Hoof	38
2. Plan of the Experimental Area Layout for the Autumn Trial	43
3. Dry Weight Production Curves. Autumn Trial	54
4. Tiller Counts. Autumn Trial	56
5. Layout for the Spring Trial	77
6. Dry Weight Production Curves Spring Trial	80
7. Tiller Counts. Spring Trial	82
8a. 'Abnormal' tillers. Perennial Ryegrass	<u>Page</u> 82a
8b. 'Abnormal' tillers. Cocksfoot	82a
9a. 'Abnormal' tillers. Browntop	82b
9b. 'Abnormal' tillers. Timothy	82b
10. Position of Growing Points. Spring Trial	<u>Facing Page</u> 87

LIST OF TABLES

AUTUMN TRIAL

<u>Table</u>	<u>Page</u>
1. Mean dry weight yield. Perennial ryegrass	52
2. Mean dry weight yield. Timothy	52
3. Mean dry weight yield. Cocksfoot	52
4. Mean dry weight yield. Browntop	52
5. Analyses of variance of the combined yield of all species at each sampling date	53
6. Results from testing for changes in mean dry weight yield with approximate "t" test	55
7. Mean tiller numbers. Perennial ryegrass	56
8. Mean tiller numbers. Timothy	56
9. Mean tiller numbers. Cocksfoot	56
10. Results from testing for changes in mean tiller number with approximate "t" test	57
11. Mean dry weight yield of other species in Perennial ryegrass plots	58
12. Mean dry weight yield of other species in Timothy plots	58
13. Mean dry weight yield of other species in Cocksfoot plots	58
14. Mean dry weight yield of other species in Browntop plots	58
15. Mean dry weight yield of <u>Sagina procumbens L.</u>	60
16. Mean dry weight yield of <u>Trifolium dubium Sibth</u>	60
17. Mean dry weight yield of <u>Trifolium repens L.</u>	60
18. Mean dry weight yield of <u>Rumex acetosella agg.</u>	60
19. Mean dry weight yield of <u>Crepis capillaris (L) Wallr.</u>	60
20. Mean dry weight yield of <u>Poa Spp.</u>	61
21. Transformed data and true mean percentages of growing points above the soil surface	62
22. Relative mean occurrence of growing points above the soil surface	63
23. Mean bulk density measurements. Perennial ryegrass plots	64
24. Mean bulk density measurements. Timothy plots	64
25. Mean bulk density measurements. Cocksfoot plots	64
26. Mean bulk density measurements. Browntop plots	64
27. Bulk density measurements. Coefficient of variation (%)	65
28. Comparison of observations on the treading resistance of certain other species	71

LIST OF TABLES (Cont.)

<u>Table</u>	<u>Page</u>
29. Comparison of bulk density values	73
30. Comparison of mechanical analyses of soil types	74
<u>SPRING TRIAL</u>	
31. Mean dry weight yield. Perennial ryegrass	78
32. Mean dry weight yield. Timothy	79
33. Mean dry weight yield. Cocksfoot	79
34. Mean dry weight yield. Browntop	79
35. Mean tiller numbers. Perennial ryegrass	81
36. Mean tiller numbers. Timothy	81
37. Mean tiller numbers. Cocksfoot	81
38. Results from testing for changes in mean tiller number with approximate "t" test	82
39. Mean percentage occurrence of 'abnormal' tillers in T plots	83
40. Mean position of the growing point. Perennial ryegrass	84
41. Mean position of the growing point. Timothy	84
42. Mean position of the growing point. Cocksfoot	84
43. Mean position of the growing point. Browntop	84
44. Relative mean occurrence of growing points above the soil surface prior to treading	85
45. Mean percentage of tillers showing internode elongation. Perennial ryegrass	86
46. Mean percentage of tillers showing internode elongation. Timothy	86
47. Mean percentage of tillers showing internode elongation. Cocksfoot	86
48. Mean percentage of tillers showing internode elongation. Browntop	86
49. Mean bulk densities. Perennial ryegrass	88
50. Mean bulk densities. Timothy	88
51. Mean bulk densities. Cocksfoot	88
52. Mean bulk densities. Browntop	88

## CHAPTER I

### INTRODUCTION

The dependence of New Zealand's economy upon grassland has frequently been emphasized.

The main features of the pastoral farming systems are; high production pastures, grass/clover combinations, mineral fertilisers, and all-the-year outdoor grazing at relatively high stocking rates (Sears, 1959). Corkill (1957) has demonstrated the role of pasture plant breeding and seed certification. Sears (1953) has shown the importance of pasture top-dressing, the grazing animal, and white clover in the improvement of soil fertility. However, many other methods of increasing the production and utilisation of herbage are under investigation (Evans, 1960).

In general, grazing techniques have been based on a rotational system for it was believed that this method had important advantages over continuous grazing systems (Levy, 1950). However, the work of McMeekan (1960) and Freer (1960) with dairy cows, and Lambourne (1956) with sheep, showed that wide differences in grazing technique have comparatively little effect on yield/acre of pasture and stock. The production efficiency was mainly dependent on a high stocking rate.

There is little information to indicate the upper limits of the stocking rate. At Ruakura, stocking levels of  $1\frac{1}{2}$  cows/acre have not reduced pasture production (Campbell, 1961); and Freer's studies on irrigated grassland in Victoria, have not produced evidence of sward deterioration after two years of grazing at 2 cows/acre. However, Edmond (1958a) and Mitchell (1960) have suggested that treading may place a ceiling on total herbage productivity.

In a review of literature, Edmond (1958b) observed that although the occurrence, general importance, and some of the special effects of treading had been studied by several workers, no attempt had been made to distinguish between the overall treading effects and those of excretion and defoliation. Therefore a technique was developed to study treading as a single factor (Edmond loc.cit.). A preliminary experiment showed that treading damaged pasture, and increased treading had an increased influence on plant and soil. Further work showed that pasture species varied considerably in their reaction to treading (Edmond, 1960). These variations have been discussed in terms of the physiological and morphological state of the plant. Bates (1937) emphasized the importance of the position of the growing point.

In Edmond's treading studies it was assumed that sheep walked 1.7 miles/day. Thus, by defining the width of narrow fenced plots a 'stocking rate equivalent' of n sheep/acre could be imitated by walking nd sheep once along the plots every d days. In practice, mobs of about 30 sheep were walked several times in each direction. Although there were some problems, it was suggested that treatments were similar to a special kind of mob stocking (Edmond 1958b).

The continued elucidation of the treading effect depends on the precise definition of the factors involved in that effect. The initiating point of treading is the hoof; and it was considered that in this thesis some useful information could be gained from the reaction of several pasture species to a closely defined force. Thus, an artificial hoof was used to apply pressures which bore some relationship to those produced by a mature sheep walking on pasture.

The growth curves of the species, as affected by treatments in the Autumn and Spring of 1961, were followed. Measurements of some of the components of this growth data were taken, and an attempt to define the position of the growing point in relation to ground level was made. Finally, changes in soil density due to the treading treatment were measured.