A STUDY OF THE REACTION

OF

FOUR GRASS SPECIES

PERENNIAL RYEGRASS (*LOLIUM PERENNE L.*)

TIMOTHY (*PHLEUM PRATENSE L.*)

COCKSFOOT (*DACTYLIS GLOMERATA L.*)

AND

BROWNTOP (*AGROSTIS TENUIS SIBTH.*)

TO AN ARTIFICIAL TREADING TREATMENT

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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 $1\frac{1}{4}$ 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.