Thesis submitted for the degree of M.Agr.Sc. in the University of New Zealand. 1939.

INHERITANCE OF GROWTH HABIT AND CALYX MARKING IN SUBTERRANEAN CLOVER.

(Trifolium subterraneum Linn.)

BY

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SECTION I.

INTRODUCTION.

Subterranean clover is an annual legume which perpetuates itself in pasture by reseeding. After flowering the peduncle turns downward, and the head enters the soil. From this habit the common and specific names have been derived.

(1) Origin of the Species.

The original home of the species is stated to be Southern Europe, Western Asia to India and North Africa (Cheeseman 1925). An account of the accidental introduction of the species into Australia gives the period as 1880-1890 (Gardner & Dunne, 1933). From there, probably, it spread to New Zealand. Though the actual time of its arrival cannot be stated, it was recorded by Cheeseman in 1906 near Auckland, where for many years it has been known as "Mangere" clover.

(2) Varietal Diversity and Pure Lines.

A considerable diversity exists within the species, numerous varieties or strains having been recognised. These strains have been named according to districts and localities in which they were found. As a result there are a number of synonyms.

That these strains are pure lines has been demonstrated both in Australia and New Zealand. Harrison (1933) has recorded that the seed from a single plant of the "Burnerang" strain was multiplied to twenty pounds in two years without a single variant appearing. Harrison (1935) also states that "....Tallarook has bred true to type over a period of years in the Burnley Pasture Plant Research Field. The flowers are normally self-fertilized and each generation of plants has great stability of type, though growing side by side with other strains". The Grasslands Division of the Plant Research Bureau of New Zealand has conducted large scale single plant trials and no variants, in numerous strains

tested, have appeared. That the strains are pure lines is to be expected as the florets of the species are self-fertilized, in fact cleistogamous (Donald & Neal-Smith 1937: Hunter 1931). Donald & Neal-Smith consider that "...mutation is the likely primary cause of the range of distinct types existent".

(3) Growth Habit.

Most strains of Subterranean Clover possess a prostrate growth habit. This is typical of Dwalganup, Nangeela, Mt.Barker and Tallarook strains, shown in Figs. 1 - 4. One strain, Burnerang (Fig. 5), has a characteristic erect, bunchy habit.

(4) Calyx Marking.

The calyces of many strains possess a red band at the base of the lobes. This banding is characteristic of the Mt. Barker and Burnerang strains (Figs. 6 and 7). Other strains, such as Dwalganup, Nangeela and Tallarook, possess no marking on the calyx tube. These unmarked types are shown in Figs. 8, 9 and 10.

(5) Scope of Investigation.

The primary purposes of the project have been to study -

(a) The inheritance of growth habit.

(b) The inheritance of calyx marking.

As far as is known at present the two habits are of equal value from a pasture point of view. Presence or absence of calyx marking may appear of little moment, but for an understanding of the genetical make-up of a species such preliminary studies as these are necessary. Whichever growth habit be found more valuable, knowledge of its mode of inheritance must be obtained in any attempted building of new strains by breeding. The value of knowledge of the inheritance of a qualitative character such as calyx-marking lies in its possible linkage with less easily recognised characters.

(6) Method of Approach.

Hybridization of strains, followed by a study of the F.1 and

F.2 generations has been the method of study. This involved emasculation and hand pollination.

The Parent Strains and their Growth Habits.

Fig. 1. Dwalganup.(S.1).
Typical prostrate habit.

Fig. 2. Nangeela.(S.3).
Typical prostrate habit.

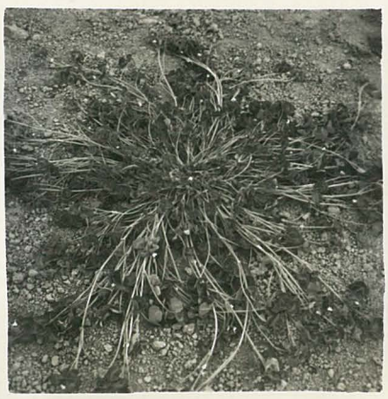

Fig. 3. Mt.Barker. (S.4).
Typical prostrate habit.

Fig. 4. Tallarook. (S.5).
Typical prostrate habit.

Fig.5. Burnerang. (S.2).
Typical erect habit.

The Parent Strains and their Calyx Markings.

Fig.6.Mt.Barker.(S.4).

Distinct red band at base of calyx lobes.

Fig.7.Burnerang.(S.2).

Calyx marking paler than Mt.Barker but distinct.

Fig.8.Dwalganup.(S.1).

No calyx marking.

Fig.9.Nangeela.(S.3).

No calyx marking.

Fig.10.Tallarook.(S.5).

No calyx marking.