CHAPTER 2

MATERIALS AND METHODS

The following is a summary of the materials and methods used in the study. A more detailed description of the materials and methods is given in the relevant articles and chapters by Mynhardt et al. (1992a, b, c & d) and chapters 7 and 8.

The A. pubescens spikelets, ecotype VH20, were obtained from the Biesiesvlakte Research Station (24° 28" E; 25° 57" S) and certified E. curvula seeds of the Ermelo cultivar were obtained from a local seed dealer. The experiment was carried out in pots under greenhouse conditions at the Grassland Research Centre, Roodeplaat. The method used was based on the replacement series of De Wit (1960).

i) Competition, biomass allocation and growth analysis

The plants were cultivated in a sandy - loam soil and grown over a period of five months. The seedlings were thinned to the desired density four weeks after emergence. The pots received tap water every second day and a commercially produced nutrient solution, UAN 32, at monthly intervals. At the end of each consecutive month, a minimum of four replicates of each treatment

and species were harvested. The competition analyses used are based upon those of De Wit (1960), where the growth of individual plants in a mixture is compared with the growth of individuals in a monoculture at the same overall density. The indices used and the derived values are explained in Mynhardt et al. (1992a). The allocation of biomass to the separate plant parts was determined as a ratio of the dry mass of the particular plant part to the dry mass of the whole plant multiplied by 100 to present the allocation as a percentage. The relationship between the total mass per plant and the mass of a plant part at various densities was determined with the aid of Bleasdale's (1966) allometric relationship. The calculated values are given in Mynhardt et al. (1992b). The growth analysis of Hunt (1982) was used to analyse the growth characteristics. The calculated rates and ratio's are explained in Mynhardt et al. (1992c).

ii) Morphology

In the morphological investigation the morphological development of four marked plants of each treatment and species was monitored fortnightly. The parameters monitored were the total number of leaves on the primary tiller, the average number of lateral tillers per plant and the average tuft height. The determined values are given in Mynhardt et al. (1992d).

iii) Photosynthesis

The net CO_2 uptake rate per unit leaf area of A. pubescens and E. curvula, at varying densities, was determined with the aid of a LICOR LI 6250 Infra - Red Gas Analyser. A once - only determination was made of which the values obtained are given in chapter 7.

iv) Field trial

To test the validity of the results found in the pot trials of A. pubescens, a field survey was conducted at the Biesiesvlakte Research Station (24° 28" E; 25° 57" S). The survey area lies 1 208 m above sea level and receives a mean annual rainfall of 475 mm. The method used was that of the nearest - neighbour as described by Yeaton & Cody (1976). The measurements made and determined values are given in chapter 8.

v) Statistical analysis

Six replicates were planned per treatment, but due to mortality a minimum of four replicates were used. Due to unbalancedness the regression analysis approach was used to analyse the data and the "student's" t - test was used to determine statistical significance at a level of $p < 0.05$ (Rayner, 1969).