LEAF GROWTH AND GROWING POINT DEVELOPMENT IN PERENNIAL RYEGRASS IN WINTER

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Grass growth in winter and early spring, in temperate regions, is severely restricted by low temperatures and frost damage. The stock carrying capacity of farms is then limited by the number of animals that can be fed during winter. Considerable variation exists in the growth rates of grasses during winter and early spring and this project has sought to determine the main reasons for this variation. Early studies (1) showed that the average growth rate of a range of grass species in winter has related to the time that tillers switched from leaf to flower production. The present study examined leaf growth rates of perennial ryegrass during the winter and spring in relation to rates of development by the apex, the plant's growing point.

Methods

Plants were sampled every week through the winter of 1985-86, from field plots of four perennial ryegrass leins that were established in April 1983 at Bridfa Blanhigion Cymru, Aberystwyth. The ryegrass lines used were: Aurora - an early flowering winter active line, Melle - a late flowering winter inactive line, Hybrids - crosses between aurora and Melle and S.24 - an early flowering winter active old variety. The hybrids had been selected for high late-winter, early-spring growth rates. The sampled plants were brought into growth cabinets at a constant 15°C/16h daylength to measure potential leaf extension rates (over 48h) and to determine the number of growing point cells, then placed in a glasshouse (15°C/16h) to determine if vernalisation requirements for flowering had been satisfied. Marked tillers in the field were used to measure leaf appearance rates.

Results and Discussion

The potential for leaf growth, of each line, increased during winter and early spring and this increase was closely matched by an increase in the rate of cell production by the apex. The greatest increase in leaf growth occurred after vernalisation and photoperiod requirements for flowering were satisfied. Leaf growth rates doubled as plants switched from leaf to flower production. The main difference between lines was in the timing of the increase in leaf growth and growing point cell production, which related directly to their time of flowering. The stimulus to leaf growth associated with the switch to flower production was greater than from any selection for increased leaf growth.

Utilising the benefits from early flowering on leaf growth in winter and early-spring depends upon the severity of local climates. In Cymru in 1985-86 the winter was more severe than normal and leaf damage from frost was great. Subclinical effects were also evident as leaf growth rates (at 15°C) of field plants were only one third that of plants kept in a growth room. This emphasised the need for frost hardiness in any commercial cultivar. The appearance and habit of plants in the field in Cymru in winter was similar to plants on the tablelands in N.S.W. where winter temperatures and frost incidence are also similar.

1. Kemp. D.R. (1985). Proc. XVth Int.Grassland Congress, Kyoto, Japan. pp. 385-6.