Perennial ryegrass - selection for improved productivity under irrigation

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Irrigated perennial pastures in northern Victoria are mainly comprised of three species, paspalum (Paspalum dilatatum), white clover (Trifolium repens) and perennial ryegrass (Lolium perenne). For reasons of pasture quality and winter growth, ryegrass is the preferred grass but it lacks summer growth and persistance in this environment. The unique nature of this environment limits the potential for introductions from homoclines. Selection from within the ryegrass population existing under irrigation is a potential method of identifying adapted genotypes. This experiment examined local accessions and introduced cultivars for their summer growth under irrigation in northern Victoria.

Methods

Local accessions were collected in May/June 1980 from northern Victoria, southern N.S.W., the high rainfall areas of north-eastern Victoria and southern Gippsland. One hundred tillers collected from each of 124 sites were planted as spaced plants on a 2Ocm by 20cm grid at Kyabram and irrigated when necessary throughout summer. The cv. Grasslands Nui was used as the control cultivar. Growth was scored (0-10). with plant habit, heading date and persistence being observed in 1980 and 1981. In April/May 1981, selections were made en masse from this material clonally replicated and transplanted as spaced plants. To broaden the genetic range of the base population under evaluation, 21 paddock lines of cv. Victorian, 12 paddock lines of cv. Kangaroo Valley and 24 introduced cultivars were sown as spaced plants with six replicates of 10 plants in rows.

Results and Discussion

Differences between irrigated and dryland accessions on the basis of summer growth and heading date were evident. Within the irrigated accessions the within line variation was larger than the between line variation, thus no individual site warranted intensive selection. No sites had comparable growth scores with cv. Nui. No correlation between heading date and summer growth was demonstrated. On an individual plant basis, positive correlations between growth assessments indicated potential for selection. Five sets of criteria were used for en masse selections based on visual characteristics, disease rating (rust occurrence), growth assessment, plant habit and heading date. The 1981 mass selections all demonstrated a positive response to the selection pressure applied when compared with a randomly selected population mean. Selections improved summer growth score by 25% over the population mean, however the selected populations rated the same as cv. Nui on the basis of summer growth.

Seedling lines demonstrated a wide range of flowering times from October 4 cv. Kangaroo Valley Early to November 23 cv. S23. The occurrence of rust was sporadic on the European and New Zealand material. whilst all lines of cv. Victorian and most lines of cv. Kangaroo Valley were severely infected. On the basis of summer growth as spaced plants, Ariki, Ellett, Kangaroo Valley Late and Nui were the best cultivars. Some of the European material eg. cv. Barvestra, Borvi and Gremie demonstrated summer growth potential but suffered severe heat stress on occasions throughout the summer.

Cultivars currently available are more summer productive than the current perennial ryegrass component of most irrigated pastures in northern Victoria. Selection from within the locally adapted population identified the potential for plant improvement, although it appears that ryegrass may not be capable of high levels of summer growth in this environment.