Performance of experimental synthetic cultivars developed from the Kangaroo Valley ecotype of perennial ryegrass (*Lolium perenne* L.) in Australia

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Abstract

The Kangaroo Valley perennial ryegrass ecotype has high winter herbage production and extremely early maturity. In a breeding program aimed at exploiting the genetic diversity within this ecotype we selected for seasonal herbage yield from the later maturing germplasm collected from 45 farms. After six years of characterisation and multi-site half-sib progeny testing, five experimental synthetics were developed. These synthetics were established during autumn 1998 at five dairying sites: Terang and Kergunyah in Victoria; Berry and Taree in New South Wales; and Gatton in Queensland. Herbage production was measured for the first two years of this ongoing trial. One synthetic, AVH 17, was identified as the most promising across a wide range of environments with a mean increase of 12% in cumulative herbage yield over cultivar Kangaroo Valley.

Key words

Lolium, perennial ryegrass, production, winter, breeding.

INTRODUCTION

Kangaroo Valley perennial ryegrass is an ecotype that has evolved over more than 100 years of natural selection in the Kangaroo Valley and Shoalhaven Plains regions of NSW (4). The ecotype is amongst the earliest flowering perennial ryegrass and has extremely good cool-season herbage growth (2). However, the ecotype is extremely variable, with flowering times from different seed production paddocks varying by up to 23 days (3).

In order to develop cultivars based on the Kangaroo Valley perennial ryegrass ecotype that were more uniform and had enhanced resistance to the diseases crown rust (*Puccinia coronata*), barley yellow dwarf (BYDV) and ryegrass mosaic (RMV) viruses, a collection of 9000 plants was made in August 1992. These plants came from 45 paddocks in the Kangaroo Valley and Shoalhaven Plains that had been sown to perennial ryegrass between 30 and 100 years previously. Characterisation of these plants at Timboon (Vic) and Berry (NSW) revealed that whilst the plants within the collection were generally lower yielding, had fewer tillers and were more susceptible to crown rust than commercial cultivars, there was considerable genetic variation within the collection (1). Five groups of half-sib families were obtained from elite plants from the population and these half-sib families were evaluated at 4 sites (Timboon and Kyabram, Vic; Berry, NSW and Gatton, Qld) for 3 years. The results of these half-sib family trials were then used to select the parents of 5 experimental synthetics. These experimental synthetics were sown at 5 sites (Terang and Kergunyah, Vic; Berry and Taree NSW; and Gatton, Qld) in the autumn of 1998. This paper presents selected dry matter yield data from these evaluation trials.

METHODS

Plots (2 x 1 m) were sown as monoculture in a row-column design with 6 replicates. Plots were cut with a rotary mower to estimate yield and were grazed after mowing. Dry matter yield data were analysed using REML procedures in Genstat 5.4.1. to calculated mean values for herbage yield at each harvest.

RESULTS AND DISCUSSION

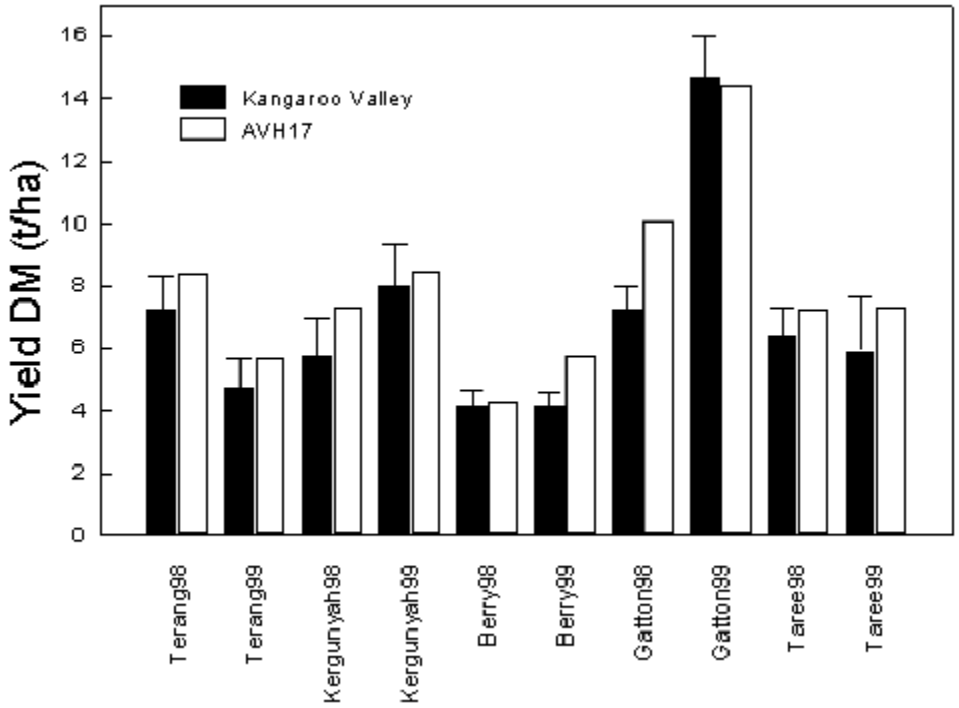

Figure 1. Dry matter yield of experimental synthetic AVH17 and Kangaroo Valley perennial ryegrass at 5 sites in 1998 and 1999. Bars represent l.s.d. (*P* = 0.05) for comparison within sites and seasons.

The experimental synthetic AVH17 had the best overall yield when herbage yield was analysed over all sites using REML procedures (data not shown). The annual dry matter yield of the synthetic varied from 4.8 t/ha to 14.5 t/ha depending on site and season and was significantly higher ($P<0.05$) in 5 of the 10 site x season combinations (Fig. 1). Several of the other experimental synthetics also produced more dry matter yield than Kangaroo Valley perennial ryegrass, but the performance of these synthetics was not as consistent as AVH17 (data not shown). These synthetic cultivar evaluation trials are currently in their third year and will conclude in 2001.

Conclusions

An improved cultivar from the Kangaroo Valley base population has been developed through the use of screening of parental genotypes for disease resistance (1) and through half-sib family evaluation in a range of dairy environments throughout Australia. This cultivar AVH17 shows broad adaptation across a range of target environments and should prove to be a replacement for the ecotype in Australian dairy environments.

References

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