# Persistence of late maturing subterranean clover cultivars in Western Australia

P.G.H. Nichols

Agriculture Western Australia and Centre for Legumes in Mediterranean Agriculture

**Abstract**

The persistence under grazing of 9 late maturing subterranean clover cultivars was monitored for 7 seasons at two long growing-season sites in south-west Western Australia. At both sites, plots of the new cultivars, Denmark Goulburn and Leura, maintained significantly higher varietal purity and both total clover and sown clover seedling densities than the older cultivars, Mt Barker, Karridale, Woogenellup, Junee, Larisa and Green Range. The higher seedling regeneration abilities of Denmark and Goulburn, in particular, provide a means of reducing the autumn-winter feed gap common in the long growing season areas of Western Australia.

**Keywords**

Subterranean clover, Trifolium subterraneum, cultivars, persistence, plot purity

In 1987 four trials were established in the long growing season zone of Western Australia as part of a national evaluation program of late maturing breeding lines of subterranean clover (Trifolium subterraneum L.). Initially 9 breeding lines, all introductions from Sardinia, were compared with 6 commercial cultivars. Data collected during the first 3 seasons from these trials was used to recommend the release of Denmark and Goulburn as new cultivars for the long growing season areas of Western Australia. Leura was also selected as a new cultivar for use in eastern Australia. Trial results from the first 3 seasons are presented in Nichols and Nicholas (1). These indicated that over a 3 year period, the new cultivars regenerated much more densely than the older cultivars. Plots of the 3 new and the 6 older cultivars were subsequently monitored at two of these sites for a further 4 seasons to measure longer term persistence. Regeneration results for year 7 from these trials are reported here.

## Materials and methods

Trials were sown in May, 1987, at Mt Barker Research Station and on a farm 5 km north of Manjimup. Plots measured 2 m x 5 m with 4 replicates of each variety. Other site details and measurements taken for the first 3 years can be found in Nichols and Nicholas (1). From December, 1989 onwards, trials were grazed by sheep in common with surrounding paddocks. In January, 1993, seed bank reserves were sampled. From this seed 100 seedlings derived from each plot were germinated in the glasshouse and their identities compared with control cultivar seedlings. No attempt was made to identify subterranean clover types not originally sown in each plot. In early May, 1993, subterranean clover seedling regeneration counts were taken at both sites, using five 25 dm2 quadrats per plot.

## Results and discussion

Mean total subterranean clover regeneration density was significantly higher at Manjimup than Mt Barker (Table 1). Over both sites plots of Denmark and Goulburn were significantly denser than all other cultivars, apart from Leura. Mean purity was similar at both sites, although a highly significant site x cultivar interaction was found (Table 1). Denmark plots maintained the highest purity, with more than 97% of Denmark seedlings at each site, but did not differ from Goulburn and Leura plots. Karridale was the only other cultivar not significantly different from Leura and Goulburn. Denmark and Goulburn also had significantly greater seedling densities of the sown subterranean clover type (Table 1) than all other cultivars apart from Leura.

These results indicate that the greater persistence of the new cultivars of Sardinian origin, Denmark, Goulburn and to a lesser extent, Leura, found over the first 3 years of these trials (1), continued for at

least 7 seasons. The higher maintenance of plot purity of the new cultivars also indicates greater competitiveness than the older ones against background or invading types. This has particular implication for farmers sowing into paddocks with resident oestrogenic subterranean clover. Nichols and Francis (2) suggest several reasons why subterranean clovers of Sardinian origin are well adapted to southern Australian farming conditions. These include a dense, leafy, relatively prostrate growth habit, enabling them to withstand heavy grazing, and a high seed setting capacity.

**Table 1. Regeneration density, percentage of sown subterranean clover and calculated regeneration density of sown subterranean clover in year 7 swards at Manjimup and Mt Barker, Western Australia.**

| Cultivar | Total sub.clover regeneration | | | Sown sub.clover purity | | | Sown sub.clover regeneration | | |
|---|---|---|---|---|---|---|---|---|---|
| ? | (plants/$m^2$) | | | (%) | | | (plants/$m^2$) | | |
| ? | Manjimup | Mt Barker | Mean | Manjimup | Mt Barker | Mean | Manjimup | Mt Barker | Mean |
| Denmark | 4892 | 4135 | 4514 | 98 | 97 | 97 | 4792 | 3992 | 4392 |
| Goulburn | 5060 | 3640 | 4350 | 88 | 91 | 89 | 4576 | 3323 | 3949 |
| Green Range | 4002 | 1553 | 2778 | 64 | 42 | 53 | 2595 | 658 | 1626 |
| Junee | 3353 | 2116 | 2734 | 65 | 49 | 57 | 2178 | 1087 | 1633 |
| Karridale | 2061 | 2248 | 2155 | 94 | 80 | 87 | 1927 | 1811 | 1869 |
| Larisa | 2061 | 2035 | 2048 | 58 | 78 | 68 | 1226 | 1613 | 1420 |
| Leura | 3882 | 2981 | 3431 | 92 | 91 | 92 | 3608 | 2726 | 3167 |
| Mt Barker | 2262 | 1580 | 1921 | 70 | 60 | 65 | 1563 | 956 | 1260 |
| Woogenellup | 1760 | 1339 | 1550 | 49 | 70 | 59 | 848 | 966 | 907 |
| Site mean | 3259 | 2403 | 2831 | 75 | 73 | 74 | 2590 | 1903 | 2247 |
| L.S.D. (0.05) | | ? | | | ? | | | ? | |
| Site | | 672***[a] | | | n.s. | | | 636*** | |

| | | | |
|---|---|---|---|
| Cultivar | 1441*** | 9*** | 1350*** |
| Site x cultivar | n.s. | 13*** | n.s. |

a * = significant at 0.05%, ** = significant at 0.01%, *** = significant at 0.001%, n.s. = not significant

## Conclusions

Use of Denmark and Goulburn subterranean clovers in the long growing season regions of Western Australia is particularly benefiting farmers by producing higher seedling densities, translating into higher autumn clover herbage production and reducing the autumn-winter feed gap. Further work is ongoing to combine the persistence of Sardinian germplasm with improved resistance to diseases and red legged earthmite.

## Acknowledgments

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## References

1. Nichols, P.G.H. and Nicholas, D.A. 1992. *West. Aust. J. Agric.* **33:** 81-86.

2. Nichols, P.G.H. and Francis, C.M. 1993. *Proc. 10th Aust. Plant Breeding Conf*., Gold Coast,. Vol. 2, 19-20.