

Responses of perennial lotus and astragalus accessions to acid soils

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There is a need to diversify the range of perennial pasture legumes used in southern Australia to reduce the "genetic vulnerability" of *Trifolium* and *Medicago* species to pests and diseases, and to fill some niches not well exploited by the present species. Reed (1) has suggested renewed investigation of alternative legumes. An attempt is being made to develop persistent, non-bloating legumes that are tolerant of infertile, acid soils, and also tolerant of winter water logging and salinity (*Lotus*) or of summer drought (*Astragalus*). This paper reports the screening of accessions on an acid soil, containing soluble manganese and aluminium (averaging 25 and 3.5 $\mu\text{g g}^{-1}$ respectively), and on an adjacent limed site in the ACT.

Materials and Methods

176 accessions of *Lotus* and 339 of *Astragalus* were obtained from US, New Zealand and Australian sources. Seedlings were raised in jiffy pots and transplanted during October, 1988, in 2 replicate lattice experiments with 4 plants per plot in a single row. Plants were 40 cm apart within rows, and rows of plots were spaced 80 cm apart. White and strawberry clover cultivars were included as controls. The plants were irrigated to ensure survival. In mid-February, 24 representative accessions each of *Lotus* and *Astragalus* were chosen, and plants in the limed and acid sites were scored by three operators against a set of standard plants. The standards and some other representatives of the size classes were cut, dried and weighed.

Results and discussion

Scores accounted for over 90% of the variability in plant dry weight. The entries differed significantly in predicted plant weight and acidity tolerance, e.g. for *Lotus*, the ranges within 19 accessions, and the means (in brackets) of plant weights on the limed soil, and the ratio of dry weights on acid and limed sites were:

Species	n	Limed site (g/plant)	Ratio acid/limed wts
<i>L. pedunculatus</i>	10	104 - 168 (124.7)	0.57 - 1.16 (0.83)
<i>L. corniculatus</i>	7	72 - 142 (123.4)	0.39 - 0.77 (0.61)
<i>L. maroccanus</i>	1	97	0.34
<i>L. australis</i>	1	35	0.66
<i>Trifolium repens</i>	2	151 - 158 (154.5)	0.55 - 0.62 (0.59)
L.S.D. (means of 2 accessions)		27	0.31

L. pedunculatus was more tolerant of the acid soil conditions than other *Lotus* species and the clovers. There were differences between accessions within *L. pedunculatus* and *L. corniculatus*. Of the winter growing, summer drought resistant species, *L. maroccanus* was sensitive, but *L. australis*, was as tolerant as *L. corniculatus*. Similar variability was apparent in *Astragalus*, but no species was as tolerant as *L. pedunculatus*, and the average degree of tolerance was n Winter growth and summer drought resistance of these accessions will be tested successively. Hybridization and mutation programs will be initiated in an attempt to breed alternative legumes for southern Australia.

1. Reed, K.F.M. (1987), in "Temperate Pastures: their Production, Management and Use". CSIRO/Aust. Wool Corp: Melbourne.