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Alternative perennial legumes on acid soils in southern New South Wales , Australia

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Key words : herbage yield , frequency , persistence , farming system

Introduction Farming systems in southern NSW have traditionally relied on annual pasture legumes in phased rotation with crops to act as a disease break , restore soil fertility and soil structure and provide high quality feed for livestock . Lucerne (*Medicago sativa* L .) is the most widely grown perennial legume in the mixed farming system due to its high nutritive value to animals and its ability to fix nitrogen . However , lucerne is unable to grow on acid soils , or poorly drained soils , or in areas where grazing is not well controlled . Alternative perennial legumes are needed to incorporate into phased farming systems to increase profitability and achieve sustainability .

Materials and methods Twenty "best-bet" perennial legume species/accessions (entries , Table 1) were selected based on previous work on acid soil and waterlogged soil (Li *et al.* 2007) and evaluated at Berremangra (34°46'07"S , 148°27'06"E , alt 342 m) near Bookham in New South Wales , Australia . The long-term annual rainfall is 667 mm . Soil type is a Dermosol (Isbell 1996) with pH_{Ca} 4.7 at 0-5 cm and 4.5 at 10-20 cm . The exchangeable Al was 5% and 13.2% for 0-5 cm and 5-10 cm , respectively . Seedling numbers at establishment , herbage yield and plant frequency were measured in 2005-2007 .

Results The site was highly acidic with a short period of waterlogging in winter during wet year . When established in 2005 , the site received above average rainfall , followed by 2 years of drought with less than half the long term average rainfall . Two *Lotus corniculatus* accessions (Goldie and composite) and *Trifolium uniflorum* demonstrated superior persistence and productivity (Figure 1) . *Trifolium uniflorum* was the only species with a satisfactory ground cover (frequency of 16.3%) in the third autumn after two years of drought (data not shown) . *Lotus tenuis* and *T. fragiferum* SA42951 had moderately high frequency , but very low herbage yield . The soil was too acid for lucerne to survive .

Table 1 Perennial legume species evaluated at Berremangra near Bookham , New South Wales in 2005-2007 .

ID	Species	ID	Species
1	<i>Cullen australasicum</i> SA4966	11	<i>Medicago sativa</i> cv . Aurora
2	<i>C. tenax</i> SA35778	12	<i>M. sativa caerulea</i> SA38052
3	<i>Dorycnium hirsutum</i> SA33717	13	<i>M. sativa falcata</i> composite
4	<i>D. pentaphyllum</i> composite*	14	<i>M. sativa</i> SA38082
5	<i>Hedysarum boutigyanum</i> SA13265	15	<i>M. suffruticosa</i> SA6529
6	<i>Lotus corniculatus</i> Composite	16	<i>Onobrychis viciifolia</i> cv . Othello
7	<i>L. corniculatus</i> cv . Goldie	17	<i>Securigeria varia</i> SA17002
8	<i>L. corniculatus</i> cv . Steadfast	18	<i>Trifolium fragiferum</i> SA38076
9	<i>L. cytisoides</i> SA12951	19	<i>T. fragiferum</i> SA42951
10	<i>L. tenuis</i> composite	20	<i>T. uniflorum</i> composite

* Composites represent 2-4 accessions selected to represent the variation within a species .

Conclusions *Lotus corniculatus* Goldie was the most productive cultivar with the greatest persistence that is suitable for the hostile environment tested . Further breeding/selection work is needed to improve flowering and seed set in the low latitude areas due to short day length . *Trifolium uniflorum* may be useful to provide ground cover in sloping landscapes to protect against soil erosion , and as a perennial legume component in perennial grass or annual pasture mixtures for intensive grazing enterprises . But seed harvest of this species would be very difficult due to its very prostrate growth habit .

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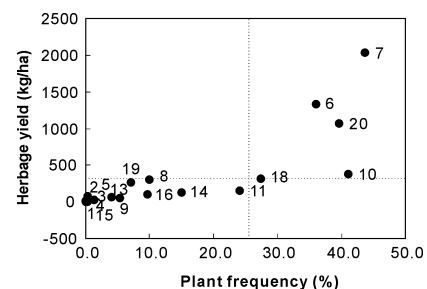


Figure 1 Relationship between plant frequency and herbage yield for sown species in year 2 . Entry numbers for each point correspond to the ID numbers given in Table 1 . Dotted lines indicate the 5 highest ranked entries either to the right of the vertical line or above the horizontal line .