

Breeding for acidic soil tolerance in lucerne

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Globally about 179 million hectares of acidic soil land area is used for crops and this occupies about 4.5% of the acidic soil area. It is estimated that the value of annual production from this area is approximately \$129 billion (Uexkull and Mutert, 1995). In NSW, Australia, it was estimated that 13.7 million hectares of agricultural land is seriously affected by acidification and a further 6 million hectares would develop this problem (Fenton, G 2002). Perennial pasture legumes such as lucerne are sensitive to low pH soils (< 4.8 CaCl₂) with high aluminium levels. The application of lime is an option for low pH soils in some instances, but it is uneconomical option for amending subsurface soils (Scott *et al* 1997, 2000).

To provide a genetic solution to this complex and difficult problem, the National Lucerne Alliance lucerne breeding and development program based at Tamworth, New South Wales, Australia is developing lucerne germplasm with improved tolerance to low pH soils and aluminium toxicity.

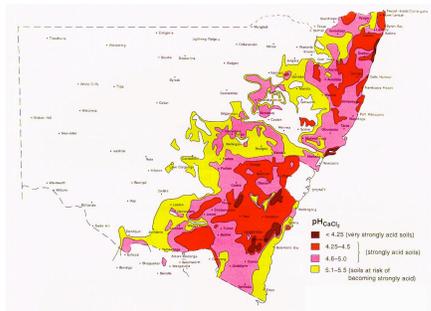


Figure 1 NSW map showing acidic soil areas (Fenton G)

Populations of lucerne seedlings were initially screened using a modified solution screening method developed by Scott BJ *et al* (2008). Root re-growth was measured for each seedling and the seedlings with the highest root re-growth were selected and polycrossed. Seed developed through recurrent selection were evaluated under field conditions in a site at Binnaway in NSW under acidic soil and Aluminium toxicities but without Manganese toxicity. The selected lines will be evaluated in different environments under acidic soil conditions with discriminating levels of Aluminium toxicities to assess their performance.

1. Uexkull von H R and Mutert E. Global extent, development and economic impact of acid soils. *Plant and Soil* (1995) 171, 1-15.
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3. Scott BJ, Conyers MK, Poile G.J Cullis, BR (1997) Subsurface acidity and liming affect yield of cereals *Aust. J. Agric. Res.* 48 843-854.
4. Scott BJ, Ridley AM, and Conyers MK (2000) Management of soil acidity in long-term pastures of south-eastern Australia: a review *Aust. J. Expt. Agric.* 40, 1173-1198
5. Scott B J, Ewing MA, Williams R, Humphries AW and Coombes NE (2008). Tolerance of aluminium toxicity in annual Medicago species and lucerne *Aust. J. Expt. Agric* 2008, 48, 499-511