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## Nitrogen fixation in irrigated lucerne (*Medicago sativa*) systems assessed using $^{15}\text{N}$ natural abundance

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**Key words :** nitrate reductase, soil nitrate

**Introduction** While lucerne is grown on some 270,000 ha in the SE of South Australia its capacity to fix  $\text{N}_2$  has not been assessed, although in eastern Australia an irrigated lucerne stand was found to fix ca 85% of its N in its fifth year, and 45% in its sixth year (90 kg N/ha/yr) (Brockwell et al., 1995). The present study examines possible  $\text{N}_2$ -fixation by irrigated lucerne in farmers fields in the principal lucerne seed producing region of Australia.

**Materials and methods** The study was conducted in the area around Keith in south-eastern South Australia in December of 2006. Five properties growing lucerne were visited and four lucerne fields under irrigation sampled on each property. Soils at the sites were mostly shallow, neutral to alkaline sododols over limestone, with a few leached mildly acid sands. Most lucerne stands had been grazed earlier in the year and each lucerne stand had already been cut once in the months preceding our visit but was currently locked up for a second hay cut. Dry matter cuts of 0.47m<sup>2</sup> were taken for estimation of dry matter production at five separate locations. Dependence of lucerne on  $\text{N}_2$ -fixation was assessed using the  $^{15}\text{N}$  natural abundance ( $^{15}\text{N}$ ) technique.

**Results and discussion** Variation in dry matter production between sites (4.6-9.9 t/ha) probably reflected time since last cutting and irrigation applied. Amounts of  $\text{N}_2$  fixed in the standing dry matter at the time of harvest ranged from 72-243 kg N/ha, with an average of 148 kg N/ha. This does not represent seasonal or annual totals, but only that in standing dry matter at the time of our sampling after the first seasonal hay cut, and it is likely that total annual  $\text{N}_2$ -fixation could be 2-3 times this. Taking a conservative approach (2x) we estimate that  $\text{N}_2$ -fixation in irrigated lucerne in this region must average >300 kg N/ha. This does not include possible contributions in lucerne root N. Kelner et al., (1997) multiplied shoot N fixed by 1.59 to account for N in roots, which for the sites in our study would equate to 477 kg N fixed/ha/yr. Further work would be required to validate these extrapolations. Nevertheless these productive pure lucerne hay/seed systems fix substantial quantities of N.

### References

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