

## Evidence for disease control as a factor in improved wheat yield in a lupin-wheat rotation

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Yields of cereal crops grown on unfertilised sandy soils of the Pilliga scrub region of New South Wales are limited because of inadequate levels of soil nitrogen (1). The narrow leaf lupin (*Lupinus angustifolius*), adapted to such soils, has the potential to build up levels of soil nitrogen by nitrogen fixation. Doyle and Herridge (1) found wheat yields were 54 to 62% higher in a lupin-wheat (LW) rotation compared with a wheat-wheat (WW) rotation and attributed this increase primarily to improved soil fertility and possibly to a reduction in cereal root diseases. This paper provides evidence which reinforces the latter contention.

### Methods

In 1979, 1980 and 1981, wheat plants from the 0 and 40 kg N/ha plots of the "Florida" site, described previously (1), were sampled for grain yield and disease assessment. In 1978, randomised blocks at this site had been planted to either wheat or lupins. In subsequent seasons, the entire site was sown to wheat with six rates of nitrogen fertiliser (0 to 100 kg N/ha as urea) superimposed on the original lupin and wheat blocks. Yield was determined on plants taken from a one metre length of row from each of 10 rows per replicate. Incidence and severity of common root rot (CRR, *Cochlioholus sativus*) were assessed on 10 of the plants from each of the one metre lengths of row used to determine yield.

### Results and Discussion

A single crop of lupins reduced, by approximately half, the level of CRR in a subsequent wheat crop compared with a WW rotation (Table 1).

**Table 1. Grain yield (kg/ha) and incidence and severity<sup>a</sup> of common root rot of wheat sown in 1979 with two rates of nitrogen into land that was planted to wheat or lupins in 1978 at "Florida" in the Pilliga Scrub.**

Crop in 1978	0 kg N/ha			40 kg N/ha		
	Yield	Incidence	Severity	Yield	Incidence	Severity
Wheat	793 <sup>b</sup>	61	1.2	1429	63	1.3
Lupin	1912	29	0.6	1552	33	0.8

<sup>a</sup>Incidence is the percentage of plants affected by CRR. Severity is a scaled rating with 0 representing less than 10% of roots infected; 1, from 11-75% of roots infected; and 2, greater than 76% of roots infected.

<sup>b</sup>Each value is the mean of four replicates.

With no added nitrogen, 29% of plants in the LW plots were diseased compared with 61% of plants in the WW plots. Lupins also reduced the severity of CRR, ratings for the WW versus LW plots being 1.2 and 0.6, respectively. The reduction in disease at this N level was reflected in higher grain yield in the LW plots. At 40 kg N/ha, CRR was also less in LW plots but grain yield was similar for both rotations, presumably because the added N either promoted production of new roots on diseased plants or boosted yields of compensating healthy plants. These results, and those reported previously, show clearly that narrow leaf lupins not only contribute to the nitrogen requirements of a subsequent wheat crop but also offer the additional benefit of controlling root disease. Unfortunately this effect did not persist beyond the first wheat crop, data for the 1980 and 1981 (not presented) seasons showing no effect of previous crop on disease.

1. Doyle, A.D. and Herridge, D.F. 1980. Internl.Congr.Dryland Farming. Adelaide. Working Papers II. p.9-11.