

Residual value of phosphate for lupins increased by deep placement

R.J. Jarvis and M.D.A. Bolland

Department of Agriculture, South Perth, Western Australia 6151

Phosphate (P) fertilizer drilled in bands below normal seeding depth may remain in moist soil for a longer duration of the growing season. This P would then be available for plant uptake for a longer continuous period. In subsequent years the residual value of this P may also be greater if shallow seeding does not disturb the P bands. Disturbance and mixing of the bands usually results in reduced effectiveness of P for plant growth due to adsorption by soil constituents, although better distribution in the soil may improve root interception.

The experiment tested whether placing superphosphate at various depths improved wheat grain yield in the year of application, and, without any further application of P, improved lupin grain yield in the second year, relative to P drilled with the seed of wheat and lupins.

Methods

The experiment was on newly-cleared, yellow loamy sand at Carrabin 300 km east of Perth receiving 300 mm average annual rainfall. After an initial 15 cm deep cultivation to incorporate applied trace elements, sulphur and nitrogen fertilizers, six rates of superphosphate (from 80-430 kg/ha) were drilled into the soil at six depths (3, 5, 7, 9, 11, 13 cm). Wheat was then sown at a depth of 3 cm. Additional treatments had the six P rates drilled with the wheat at 3 cm while seeding. The control treatment received no phosphate. In the following year inoculated lupins (*Lupinus angustifolius* cv. Danja) were direct drilled 3 cm deep with no P. In addition, two rates of superphosphate were drilled with the lupin seed at 3 cm depth on some of the previous years nil P treatments.

Results and discussion

The wheat sown over the 7 cm deep P bands produced 14% more grain than P drilled with the seed. The nil-P treatment produced no grain.

In the second year, the residual of 430 kg/ha super banded 7 cm, and deeper, produced double the lupin grain yield compared with P previously drilled with the wheat seed. The residual of the 7 cm banded P also produced 60% more lupin grain than P freshly drilled with the lupins (Table 1). The increased lupin grain yield in response to the deeper placed P was mainly due to increased production of lateral pods. Preliminary observations suggest that the higher yields were due to increased root growth and soil water extraction.

Table 1. Lupin grain yields (t/ha) and lateral and main pod grain ratio from two rates of superphosphate banded or drilled with seed

Time and placement of super	Rate of super (kg/ha)		Ratio grain from <u>lateral</u> pods main
	154	430	
Drilled with wheat 3 cm 1987	0.18	0.56	1.1
Banded 7 cm deep 1987	0.24	1.18	2.3
Drilled with lupins 3 cm 1988	0.19	0.71	1.4