Phosphorus uptake by phalaris from ³²p-labelled seed coatings and drilled granules

J. M. Scott, R.L. Rocks and G.J. Blair

Department of Agronomy and Soil Science, University of New England, Armidale. N.S.W. 2351 CSIRO Division of Animal Production, Pastoral Research Station, Armidale. N.S.W. 2350

Early seedling growth of phalaris is promoted more by seed coatings containing phosphorus (P) at 5 kg P/ha (as MCP) than by the equivalent rate of P drilled in with the seed (1). The reasons for this increased efficiency of fertilizer use are poorly understood; a pot trial was conducted in a growth chamber to investigate how fertilizer P uptake varied with solubility of P source, application method and soil P level.

Methods

Two phosphorus fertilizers, monocalcium phosphate (MCP at 4 kg P/ha) and dicalcium phosphate (DCP at 8.4 kg P/ha), were labelled with ³²P and applied as a seed coat to phalaris (cv. Sirosa) or as drilled granules. The phalaris was sown at 8.3 kg/ha in a P-deficient sandy loam soil supplied with basal nutrients and 2 background levels of unlabelled P (5 and 40 kg P/ha as MCP). In situ counts of the labelled fertilizer were taken adjacent to the shoots at various time intervals; the trial was harvested after 65 days and the dry matter, P content and ³²P content of shoots and roots determined.

Results and discussion

The in situ activity in the phalaris leaves (at 31 days from sowing) was more than 10 times higher with drilled MCP compared to drilled DCP, regardless of background soil P levels, in spite of the DCP having been applied at more than twice the rate of MCP. The coated MCP treatment produced 25-75% higher in situ counts than drilled MCP at 31 days and

35-60% higher counts at 56 days after sowing. At harvest, the percentage of P in the plant tissues derived from the ³²P-labelled fertilizer (Table 1) was far higher with drilled MCP than drilled DCP and higher still with coated MCP. Drilled DCP provided only 40 pg P/kg of P applied whilst drilled MCP supplied 240 pg and coated MCP 380 pg P/kg of P applied.

Table 1. Percentage of P in shoots and roots of phalaris derived from the ³²P-labelled fertilizer applied as seed coatings or as drilled granules. Values followed by the same letter are not significantly different (P>0.05).

Application	P source	5	Background :	soil P	(kg/)	na) 4	0
method	1 000100		Shoots			Roots	0
				(%)			
Drill	DCP	4.00 c	0.91 e	4	.00 t	0.8	9 v
Drill	MCP	11.85 b	2.61 d	10	.34 s	2.5	5 u
Coat	MCP	19.68 a	4.70 o	17	.07 r	3.6	0 ti

These large differences in the availability of fertilizer P were more evident in soil of low P status, although the relative treatment differences were still evident in the high P soil. The major effects observed can be attributed firstly to the MCP being water soluble and, secondly, to the coating being more available than a drilled application due, presumably, to proximity of placement.

1. Scott, J.M. and Blair, G.J. (1985). Proc. 3rd Aust. Agron. Conf., Hobart, p.180.