

Comparative phosphate requirements of burr medic, yellow serradella and subterranean clover

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The comparative phosphate requirements of two promising annual pasture legume species burr medic (*Medicago polymorpha* var *brevispina*) and yellow serradella (*Ornithopus compressus*) relative to subclover (*Trifolium subterraneum*) grown on acid to marginally acid wheatbelt soils (<400 mm annual rainfall) are not known. This paper examines the hypothesis that yellow serradella requires less phosphate than subclover and subclover less than burr medic to achieve 90% maximum dry matter yield on a Bodallin sand (pH = 5.0 in CaCl₂, Colwell P = 5-9 ppm) and a Carrabin sandy loam (pH = 4.6, Colwell P = 11-13 ppm).

Methods

Seed of each species was sown on an equal seed weight basis into 1.8 kg of sieved (<2 mm) soil and the soil watered to field capacity. Cultivars of similar maturity length were compared in their response to seven rates of applied superphosphate, under glasshouse conditions.

Results and discussion

Table 1. The amount of phosphate (mg P / kg soil) required to achieve 90% maximum dry matter yield (i.e., external requirement).

Maturity Length ¹	Species	mg P / kg soil required for 90% maximum yield ²	
		Bodallin	Carrabin
95	<i>O. compressus</i> cv Madeira	38	45
100	<i>T. subterraneum</i> cv Dalkieth	71	65
98	<i>M. polymorpha</i> cv Circle Valley	97	87
77	<i>T. subterraneum</i> cv Nungarin	68	-
70	<i>M. polymorpha</i> cv Serena	92	-

1: Days to first flower in Perth.

2: Species of the same maturity length reached same maximum yield.

Serradella required less phosphate than subclover and subclover less than burr medic in achieving 90% maximum dry matter yield on both soil types (Table 1). Differences observed in external requirements were probably due to differences in phosphorus uptake by the roots, as the annual legumes were found to have similar internal efficiencies of phosphate use. Blair and Cordero (1) related the greater external efficiency of yellow serradella over subclover in the glasshouse to a greater root efficiency (i.e., serradella could take up more P per g root material). Differences were observed in root:shoot ratios and root weight between the annual legumes, with roots of subclover and burr medic requiring similar amounts as their tops to achieve 90% maximum root growth. Yellow serradella roots required less phosphate (1.8-2.8 times) than their tops to achieve 90% maximum yield.

1. Blair, G.J., and Cordero, S. (1978), Plant and Soil 50, 387-398.