

Abstract

Response of Mungbean Root System Architecture to Phosphorus Application Methods [†]

Vijaya Singh ^{1,*}, Marisa Collins ¹, Colin Andrew Douglas ² and Michael Bell ¹

¹ School of Agriculture and Food Sciences, The University of Queensland, Gatton, QLD 4343, Australia; v.singh@uq.edu.au (S.V.); m.collins@uq.edu.au (C.M.); m.bell4@uq.edu.au (B.M.)

² Department of Agriculture and Fisheries, Hermitage Research Facility, 604 Yangan Road, Warwick, QLD 4370, Australia; Col.Douglas@daf.qld.gov.au

* Correspondence: v.singh@uq.edu.au

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Abstract: In recent years phosphorus application methods have become an important management strategy for optimising the uptake of the immobile nutrient phosphorus (P). Root system architecture (RSA) could play a particularly important role in the uptake of P by grain legumes, due to their relatively coarse root systems. The objective of this study was to understand the response of mungbean root systems to P application methods. Four mungbean varieties were grown in purpose-built soil filled root chambers that received five P application methods. Phosphorus treatments consisted of a control (no application of P) compared with 30 mg P/kg soil throughout the soil volume (high P treatment) or restricted to 10cm deep layers in the topsoil or in a layer from 20-30cm deep. A fifth treatment consisted of the same amount of P as applied in deeper dispersed layer applied in a concentrated band at 25cm depth. After 50 days of growth, plant were destructively harvested and shoot and root parameters were measured. Mungbean varieties responded differently to P application methods, with Jade and Berken varieties showing greater root proliferation at depth and greater shoot growth in response to banded and deeper dispersed P applications, relative to the late maturing variety Putland. Shallow dispersed P and the no-P control both resulted in poor root growth in all the genotypes except Celera II, which did not respond to P application from any placement strategy. Results suggest that P application strategies may need to vary with variety to maximize the uptake of P.

Keywords: phosphorus acquisition; mungbean varieties; root system architecture; phosphorus application methods; deep banding



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