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“Bridging the gap between increasing knowledge and decreasing resources”

Effect of Early Mycorrhisation and Root Length on Low Phosphorus Tolerance of West African Millet

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Abstract

Phosphorus deficiency at early seedling stages is critical for final yield of pearl millet. Longer roots and colonisation with arbuscular mycorrhizal (AM) fungi are well known to enhance P uptake and crop performance. Assessing the genotypic variation of early mycorrhisation and its effect on plant growth is important to clarify mechanisms of tolerance to low soil P. In this study, eight pearl millet varieties contrasting in tolerance to low P were grown in pots under low P (no P supply) and high P (0.4 g P pot⁻¹) conditions and harvested at two, four, six and eight weeks after sowing (WAS). Root length was calculated at 2 WAS through scanning of dissected roots and evaluation with WinRhizo software. AM infection (%) and P uptake (shoot P concentration multiplied per shoot dry matter) were measured at each harvest.

Under low P, tolerant genotypes had higher total root length infected with AM fungi across harvests (83.700 cm), higher percentage of AM colonisation (11.6 %) and increased P uptake (69.4 mg P plant⁻¹) compared to sensitive lines (17.700 cm, 7.1 % and 46.4 mg P plant⁻¹, respectively). At 2 WAS tolerant genotypes were infected more than sensitive ones (4.1 % and 2.1 %) and the tolerant genotypes differed in the timing of peak of infection. AM colonisation was positively related to final dry matter production in pots, which also corresponded to field performance. Early mycorrhisation enhances P uptake in pearl millet grown under P-deficiency, with the genotypic variation for this parameter allowing selection for better performance under field conditions.

Keywords: Acid soils, arbuscular mycorrhizal fungi, P deficiency, P use efficiency