

PHOSPHORUS LIMITATION ENLARGES THE ROOT SYSTEM ALONG WITH CONTRASTING EXPRESSIONS OF PHOSPHATE AND NITRATE TRANSPORTERS IN FOXTAIL MILLET (*SETARIA ITALICA* L.)

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Foxtail millet is being studied as a model crop for cereals owing to its adaptability to nutrient-poor soils. We previously found a smaller root system with an enlarged root diameter in foxtail millet that facilitates nutrient transport under nitrogen limitation. How foxtail millet responds to phosphate limitation (LP) remains unaddressed. In this study, LP seedlings of the sequenced variety Yugu1 were grown under hydroponic culture. LP plants had significantly lower P concentrations and displayed higher levels of anthocyanin accumulation in leaves. A more extensive root system was developed primarily via stimulation of lateral root proliferation regarding the number, density, and length in foxtail millet under P limitations. Preferential biomass accumulation in the root under LP ensured carbon provision for root expansion and resulted in significant increases in the total and specific root length, which substantially extended the absorptive surface of P in the growth medium. Elevation of auxin and gibberellin concentrations might serve as an internal boost supporting root architectural re-patterning under LP. Not a just morphological adaptation, up-regulation of expression of *SiPHT1;1* and *SiPHT1;4* in roots and that of *SiPHT1;2* in roots and shoots preconditioned adaptive enhancement of P uptake and translocation under LP. By a more extensive root system of LP plants, internal nitrogen surpluses occurred as indicated by higher concentrations of nitrogen in roots and dramatic increases in free amino acids in shoots and roots. Such nitrogen surplus 'signals' tended to switch down expression of nitrate transporters *SiNRT2.1* and *SiNAR2.1* in the root and that of *SiNRT1.11* and *SiNRT1.12* in the shoot to reduce nitrate mobilization towards or within the shoot. Together, our work provided new insights into the adaption of a critical cereal crop to LP and its innate connections with nitrogen.

Biography

Zeeshan Ahmad is a PhD Scholar under CSC Scholarship in The Key Laboratory of Plant-Soil Interactions, MOE; Department of Plant Nutrition, China Agricultural University, Beijing, China. His primary research work is on foxtail millet (*Setaria italica* L.). How it responds to nutrient limitations especially Nitrogen and Phosphorus. He has published two papers in *Frontiers in Plant science*. He is also researching maize (mutant lines) response to LP at vegetative stage under hydroponic conditions. He has also published one paper in *Pakistan Journal of Agricultural Sciences* while working with rice (*Oryza sativa* L. response to Potassium. Xuexian Li is his supervisor during his PhD research.

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