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Root Morphological Plasticity for Heterogeneous Phosphorus Supply in *Zea mays* L.

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Abstract: The morphological plasticity of roots in nutrient-enriched patches of soil is regarded as an adaptive response in plants, but its functional efficiency is still debatable. We examined whether the efficiency is dependent upon the patch size, or the amount of phosphate (P) supplied in maize (*Zea mays* L.). Two levels of P-input (high and low) and three patch sizes (large, medium and small) were used in various combinations in containers filled with soil. Irrespective of the P-inputs, P uptake and biomass were greatest in large patches together with root proliferation restricted to the soil inside patches, indicating that the effect of P-patch size was stronger than the amount of P supplied. Due to the fine root proliferation (about 0.5mm-width) of higher specific root length, the root length promoted was not accompanied by more biomass investment inside the patches. For the medium and small patches, such a localized root proliferation disappeared, resulting in impaired plant growth with limited P acquisition. It was concluded that the efficiency of the root plasticity on P acquisition depends on the size of P patches more strongly than the inputs.

Keywords: [Nutrient patches](#), [Phenotypic plasticity](#), [Phosphorus uptake](#), [Resource foraging](#), [Root proliferation](#), [Soil heterogeneity](#), [Zea mays](#)



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