

Exploring the role of plasticity in root architecture for plant adaptation to environmental constraints

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Abstract

Plants, as immobile organisms, depend on their roots to access soil resources efficiently and cost-effectively. To achieve this goal as well as develop more productive crops and adapt to variable challenging conditions plants rely on root phenotypic plasticity. This includes changes in root morphology, growth angles, diameter, elongation, branching density, and rotation rate. In simpler terms, a plant root system is a dynamic structure that can change its branching structure in response to changes in biotic and abiotic conditions such as water availability, soil mineral nutrient content, soil compaction, salinity, and the formation of symbiotic relationships with other organisms or anchored in the substrate. However, the complexity of these responses and their impact on plant fitness are not well understood. In this study, we have reviewed different aspects of the morphological plasticity of the root system. The results show that root flexibility can greatly help plant adaptation. Thus, gaining a comprehensive understanding of root plasticity can lead to improved and sustainable plant production.

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