

Root responses to soil flooding

Flooded soils, where pore spaces are saturated with water for transient or prolonged periods, impose stress conditions for plant growth. During flooding, oxygen (O₂) is rapidly depleted by root respiration and microbial activity, leaving the soil practically devoid of O₂. Prolonged flooding also alters redox conditions in rhizosphere, leading to the reduction and accumulation of micro-nutrients such as iron, manganese and sulfur, to phytotoxic levels for plant growth. This presentation will address the principal stress factors plants experience under flooding and the root traits associated with flooding adaptation. I will emphasize the root anatomical, morphological and physiological characteristics that enhance O₂ diffusion from shoots to roots and the efficient use under hypoxic conditions. In addition, I will discuss the chemical characterization and location of apoplastic barriers that restrict radial O₂ loss from roots to rhizosphere and limit the entry of toxic compounds from the rhizosphere into the root. Together, these mechanisms illustrate how roots balance internal aeration and protection in flooded environments, providing key insights for crop resistance to flooding conditions.