

UNCOVERING THE SHOOT APICAL MERISTEM ADAPTATIONS TO CHRONIC HYPOXIA MAY PROVIDE NEW INSIGHTS FOR IMPROVING PLANT TOLERANCE TO SUBMERGENCE

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Plants experience low oxygen stress during submergence and have developed various mechanisms to tolerate its deleterious effects on cellular energy production. Despite this, the existence of chronic hypoxia (oxygen deficiency) in the shoot apical meristem (SAM) is physiologically necessary to maintain vital activity. The apparent sharp decline of O₂ level in the meristematic cells is easily confirmed by direct measurement using an oxygen electrode. Indeed, here physiological hypoxia supports the ability of the meristem to produce new leaves in order to maintain growth and development. How the SAM is adapted and maintains a low oxygen condition is currently unknown, but this information would provide important hints to improve plant tolerance to submergence-induced hypoxia. We discovered the presence of a cuticle-like layer that covers the SAM, which is a known adaptive trait that controls oxygen diffusion in submerged plants. Characterizing the role of the cuticle as a barrier to oxygen diffusion and exploring its composition can provide perspectives in improving submergence tolerance. Different approaches, such as the identification of cuticle biosynthesis mutants, direct oxygen measurements using biosensors, and monitoring of hypoxia-inducible gene expression will be considered for identifying the mechanisms for maintaining hypoxia.