SUPERSENSITIVITY AND SUPERRESISTENCE OF RICE PLANT Oryza sativa L. TO OXIGEN STRESS

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ABSTRACT

Among crop plants rice is unique with regard to both agrotechnics of its cultivation and the pattern of its oxygen regime. Ninety percent of rice is planted in flooded soils i.e. in the medium with an acute oxygen deficiency. However, electron microscopy has unexpectedly revealed a paradoxical phenomenon - the supersensitivity to oxygen deficiency of the fine structure of mitochondria and other subcellular structures of mature rice roots. On the other hand, biochemical and cytological investigations of anaerobically and aerobically germinated rice seeds demonstrated super-resistance to anoxia of cell ultrastructure of coleoptyle, which is capable of growth with no oxygen in the medium, retaining intact and functionally active mitochondria.

The data obtained suggest two main strategies of rice adaptation to soil oxygen stress : (1) biochemcial adaptation effected at the molecular level (true resistance); (2) adaptation at the level of whole plant effected through molecular oxygen transport (apparent resistance).

The paper discusses anatomical, cytological, physiological and biochemical aspects of supersensitivity and superresistence to oxygen stress of rice and Echinochloa, a rice field weed, in comparison with other wild plants growing on flooded anaerobic soils.