

水稻根表铁膜形成机制及其生态环境效应

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Mechanisms of iron plaque formation on root surface of rice plants and their ecological and environmental effects: A review

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摘要

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摘要 许多水生植物的根系表面及其根际微环境都具有形成铁膜的能力, 根表铁膜是植物适应水生环境的重要机制。本文叙述了水稻根表铁膜的形成条件、化学组成与空间分布, 分析了根表铁膜形成的生理与分子机理。探讨了根系氧化酶、氧化性物质、根系泌氧能力、根际氧化性微生物活性及相关基因在铁膜形成过程中的作用; 在此基础上, 进一步分析了水稻根表铁膜的营养效应和阻止重金属离子对根系的毒害效应。最后就根表铁膜的研究方法与调节机制进行了展望。

关键词: 水稻 铁膜 形成机制 生态环境效应

Abstract: Many aquatic plants can form iron plaque on their root surface and rhizosphere. Formation of iron plaque on root surface is an important mechanism for aquatic plants to adapt aquatic environmental stress. In this study, the conditions for iron plaque formation, their chemical components and spatial distribution are reviewed, and the molecular and physiological mechanisms of formation of iron plaque are elucidated. The roles of oxidase, oxidative substances, oxygen-excreted capacity of rice roots, oxidative microbes in the rhizosphere and process-related gene regulation in the formation of iron plaque on the surface of rice roots are discussed. Based on the above, the ecological and environmental effects of iron plaque including enhancement of nutrient uptake and avoiding heavy metal toxicity are analysed. Finally, analytical method for iron plaque measurement and their regulatory mechanisms are prospected for future study.

Keywords: rice plants iron plaque formation mechanism ecological and environmental effects

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