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不同镁浓度对水稻根系生长及生理特性的影响

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Effects of different magnesium nutrition on root growth and physiological characteristics of rice

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摘要 | 参考文献 | 相关文章

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摘要 在温室条件下, 采用溶液培养法研究了不同Mg^{2+} 浓度对水稻(*Oryza sativa* L.)根系生长及生理特性的影响。结果表明，水稻根系干重、根冠比、总根长、Mg吸收、根系活力、伤流速度、伤流液中游离氨基酸总量和Mg含量、Mg流入速率以及Mg^{2+} 吸收速率与Mg^{2+} 供应水平密切相关。在低Mg^{2+} 浓度(0.05 mmol/L)条件下，水稻植株叶片在缺Mg症状出现之前分配较大比例的干物质到根系，使总根长和根冠比增加, 这可能是水稻早期对低Mg胁迫的适应机制之一。适中的Mg^{2+} 浓度(1.0 mmol/L)有利于水稻生长发育，促进养分吸收，提高根系活力和伤流速度以及伤流液中游离氨基酸总量。低Mg^{2+} 和高Mg^{2+} 浓度(5.0 mmol/L)在一定程度上抑制根系活力和氨基酸合成能力。植物Mg的吸收、伤流液Mg^{2+} 浓度、根系平均Mg流入速率和Mg^{2+} 吸收速率随营养液Mg^{2+} 浓度的增加而相应增加。

关键词： 镁浓度, 水稻, 根系, 生理特性 镁浓度, 水稻, 根系, 生理特性

Abstract:

Magnesium (Mg) is one of the essential nutrients for higher plants. It plays an essential role in photosynthesis and many other metabolic processes. Rice (*Oryza sativa* L.) plants were grown in hydroponics culture at three Mg^{2+} levels under a greenhouse conditions to investigate the effects of different Mg concentrations on root growth, Mg uptake and some related physiological characteristics of rice. The results showed that root dry matter weight, root to shoot ratio, total root length, root activity, bleeding sap flow rate, the concentrations of total free amino acids and Mg in bleeding sap, Mg influx rate and Mg uptake rate of rice were significantly related to Mg supply levels. At low Mg^{2+} supply (0.05 mmol/L), rice plants partitioned larger proportion of dry matter to the roots causing to an increase of total root length and root to shoot dry weight ratio before Mg deficiency in rice leaves, which might be one of adaptive low-Mg-stress mechanisms of rice at early growth stage. Moderate Mg^{2+} supply (1.0 mmol/L) was able to promote plant growth and development, increase dry matter yield, and enhance root activity and bleeding sap rate as well as the total free amino acids contents. Root activity and amino-synthesized power might be restrained to a certain extent by low or high levels of Mg^{2+} (5.0 mmol/L). The results also showed that Mg uptake, Mg concentrations in the bleeding saps, average Mg influx rate and the Mg uptake rate were significantly increased with an increase of Mg^{2+} concentrations in the nutrient solution.

Keywords:

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