

研究论文

FACE对水稻根系及产量的影响

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摘要 2002—2003年利用我国惟一的农田开放式空气CO₂浓度增高(FACE)研究平台, 以武香粳14为供试品种, 设施N量150 kg·hm⁻²(LN)、250 kg·hm⁻²(NN)、350 kg·hm⁻²(HN) 3个处理, 研究了大气CO₂浓度比对照高200 μmol·mol⁻¹的FACE处理对水稻根系形态性状、根系活性和产量的影响。结果表明, (1) FACE使LN、NN、HN处理水稻抽穗期的每穴不定根数、每穴不定根总长度、每穴根系体积和每穴根干重均显著或极显著高于对照, 使水稻抽穗期单位干重根系总吸收面积、活跃吸收面积和α-萘胺氧化量等参数均极显著低于对照, 对水稻抽穗期每条不定根的粗度无显著影响; (2) FACE使LN、NN、HN处理的水稻产量均极显著高于对照, 2002年平均比对照增产14.35%, 2003年平均比对照增产13.87%; (3) FACE条件下水稻产量与抽穗期每穴不定根总长度、每穴根干重、每穴根系活跃吸收表面积均呈线性正相关, 相关系数分别为0.57**、0.67**、0.74*, 均达显著或极显著水平, 与其他根系性状的关系不密切。

关键词 [水稻](#) [FACE](#) [施N量](#) [根系](#) [产量](#)

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Effects of Free-air CO₂ Enrichment on Root System and Yield in Rice (*Oryza sativa* L.)

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Abstract Increasing atmospheric CO₂ concentrations are generally expected to enhance photosynthesis and growth and as a result substantially increase yields in plants. However, little is known about the effect of elevated CO₂ on root growth of rice. The experiment conducted at Anzhen town, Jiangsu, China, to study the effect of Free-air CO₂ Enrichment [FACE, 200 μmol·mol⁻¹ higher than Ambient(AMB)] on root morphological and physiological traits and yield in rice under field condition at three levels of N supply, which were low (LN, 15 g N·m⁻²), normal (NN, 25 g N·m⁻²) and high N (HN, 35 g N·m⁻²), respectively, in 2002 and 2003, the NN level was similar to that recommended by local farmers. The rice cultivar employed was japonica cultivar Wuxiangjing 14. Across the 2 years, results showed that the number of adventitious roots per plant, total length of adventitious roots per plant, roots volume per plant, dry weight of roots per plant under FACE condition were significantly higher than that under ambient air condition at heading, whereas total root absorption area per unit dry weight of root, active absorption area per unit dry weight of root and the amount of a-NA per unit dry weight of root under FACE condition were significantly lower than that under ambient air condition, and there was no obvious effect of FACE on diameter per adventitious root at heading stage. FACE treatment resulted in the significant increase in grain yield of rice at all N levels applied. And the grain yield of rice was significantly correlated with root length, root dry weight, active root absorption area per plant under FACE condition, the coefficients were 0.57**, 0.67**, 0.74*, respectively.

Key words [Rice](#); [Free-air CO₂ Enrichment](#); [N applied](#) [Root system](#); [Yield](#)

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