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研究论文

水稻不同生育时期N素营养对FACE响应的研究

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摘要 2001、2002年利用我国惟一的农田开放式空气CO2浓度增高(FACE)系统平台，研究不同施N量条件下，对武香粳14不同生育时期N素含量、N素吸收、N素分配和N素效率的影响，结果表明：(1)除移栽后16 d，FACE使其他生育期稻株含N率显著或极显著下降，生育中期的降幅大于生育前、后期；(2)FACE使水稻不同生育期N素吸收量增加，生育前期的增幅明显大于生育中、后期；(3)FACE使茎鞘(生育前中期)或稻穗(生育后期)的N素积累能力相对增强，使叶片的N素积累能力相对减弱；(4)除移栽后16 d，FACE使其他生育期水稻N素物质生产效率显著或极显著增加；FACE使水稻N素籽粒生产效率和收获指数增加；(5)增施N肥，使水稻生育中后期植株N素含量和吸收量增加，使N素效率下降，而对N素在各器官中的分配影响较小；(6) FACE和N处理对水稻N素营养的互作效应较小。

关键词 水稻 开放式空气CO2浓度增加 N素含量 N素吸收 N素分配 N素效率

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Effects of Free-air CO2 Enrichment(FACE) on Nitrogen Nutrition at Different Growth Stages in Rice(Oryza sativa L.) Cultivar Wuxiangjing 14

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Abstract Global atmospheric carbon dioxide(CO2) concentrations will probably reach to the levels of 650—780 μL • L-1 at the end of this century (IPCC, 2000). Because CO2 is needed for plant photosynthesis, this increment has the potential to enhance the growth and development of many agricultural crop species. However, little knowledge is known about free-air CO2 enrichment(FACE) and its interactive effects with nitrogen supply on nitrogen content, nitrogen uptake, nitrogen distribution and nitrogen efficiency of rice plant at different growth stages. A FACE experiment at Anzhen, Wuxi, Jiangsu Province, in 2001—2002 was conducted, using the japonica cultivar Wuxiangjing 14. The target concentration of CO2 in the FACE plots exceeded that in the ambient air by 200 μL • L-1. Two levels of N were supplied: low (LN, 150 kg • ha-1) and normal (NN, 250 kg • ha-1). Results showed that：(1) Nitrogen content(%，based on dry weight) in rice plant sampled at different growth stages except 16d after transplanting all decreased significantly under FACE treatment compared with CK，and the decreasing rate at middle growth stage(MGS) was larger than that at early(EGS) and late growth stage(LGS). (2) Nitrogen accumulation in rice plant increased under FACE treatment，and the increasing rate at EGS was larger than that at MGS and LGS. (3) Nitrogen distributed to stem(at EGS and MGS) and spike(at LGS) was higher, while that to leaves was lower under FACE treatment. (4) FACE treatment resulted in the significant increase or increase in nitrogen use efficiency for biomass and grain yield and nitrogen harvest index at different growth stages except 16d after transplanting. (5) Nitrogen content(%) and nitrogen accumulation at MGS and LGS were increased，but nitrogen use efficiency was decreased when the high N was applied. (6) Effects of N treatments on nitrogen distribution were small, and the interaction between nitrogen and FACE treatments on nitrogen nutrient was also small.

Key words Rice；Free-air CO2 enrichment(FACE)；Nitrogen content；Nitrogen uptake；Nitrogen distribution；Nitrogen efficiency

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