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研究论文

冬小麦旺盛生长期间CO2浓度升高对根际呼吸的影响

寇太记[1,2],朱建国[1,*],谢祖彬[1],刘钢[1],曾青[1]

1. 中国科学院南京土壤研究所土壤与农业可持续发展国家重点实验室 南京210008 2. 中国科学院研究生院 北京100049

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摘要 依托FACE（free air carbon dioxide enrichment）技术平台, 利用阻断根法,采用LI6400红外气体分析仪(IRGA)-田间原位测定的方法,研究了大气CO_2浓度升高和不同氮肥水平对水稻/小麦轮作制中冬小麦旺盛生长期间根际呼吸的影响。结果表明,在整个测定期间,大气CO_2浓度升高增强了根际呼吸速率，提高了根际呼吸排放量。在高N和低N处理中，高CO_2浓度下的根际呼吸总排放量分别比Ambient极显著增加117.0% 和90.8%。根际呼吸速率在孕穗初期达到最大值；使根际呼吸在土壤呼吸中的比重由24.5%(LN)～26.7(HN)提高到39.8%(LN)～47.1%(HN)。CO_2浓度升高与氮肥用量对根际呼吸产生交互效应。表明大气CO_2浓度升高将加快土壤向大气的CO_2排放，结果将有助于评价未来高CO_2浓度背景下农田生态系统土壤碳的固定潜力。

关键词 CO_2浓度升高 _ 冬小麦 _ 根际呼吸 _ 生育阶段

分类号

pCO2 on rhizospheric respiration during the wheat growth period from 106183 days after germination

KOU Tai-Ji[1,2], ZHU Jian-Gou[1,*], XIE Zu-Bin[1], LIU Gang[1], ZENG Qing[1]

1 *State Key Laboratory of Soil and Sustainable Agriculture, Institute of Soil Science, Chinese Academy of Sciences, Nanjing* 210008, *China*
2 *Graduate School of Chinese Academy of Sciences, Beijing* 100049, *China*

Abstract

A Free-Air Carbon Dioxide Enrichment (FACE) system and root-isolation methods were used to study the effects of elevated atmospheric pCO_2 and nitrogen fertilisation on rhizospheric and soil respiration, determined by in situ IRGA (LI6400) measurements, during the growth of wheat (Triticum aestivum L. cv Yangmai 14) between 106 and 183 days after germination in a wheat/rice rotation system. The results showed that elevated atmospheric pCO_2 increased rhizospheric respiration rate and cumulative CO_2 emissions during the experimental period. Under high nitrogen fertilisation (HN) and low nitrogen fertilisation (LN) treatments, elevated atmospheric pCO_2 increased cumulative rhizospheric respiration by 117-0% and 90.8%, respectively. The proportion of cumulative rhizospheric respiration to cumulative soil respiration increased from 24.5% to 39.8% (LN) and 26.7% to 47.1% (HN). While nitrogen fertilisation did not significantly influence rhizospheric respiration, the interaction of elevated atmospheric pCO_2 and nitrogen fertilisation significantly increased rhizospheric respiration. The increase in rhizospheric and soil respiration under conditions of elevated atmospheric pCO_2 indicates that, under future higher CO_2 scenarios, C exchange between the atmosphere and soil will increase in arable ecosystems.

Key words _ elevated atmospheric pCO_2 _ winter wheat _ rhizospheric respiration _ growth stage

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通讯作者 朱建国 jgzhu@mail.issas.ac.cn