

保护地土壤N₂O排放通量特征研究武其甫¹, 武雪萍^{1,2*}, 李银坤¹, 吴会军^{1,2}, 闫鹏³, 张彦才⁴, 李若楠⁴, 王丽英⁴, 王小彬^{1,2}, 蔡典雄^{1,2}

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Studies on the fluxes of nitrous oxide from greenhouse vegetable soil

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摘要

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摘要 为研究保护地土壤N₂O排放通量特征,于2009年8~12月,在河北辛集不施氮(N0)、当地习惯施氮(N900)及减量施氮(N675)处理下的秋冬季番茄保护地土壤上使用静态箱采集、气相色谱仪检测的方法测定了土壤N₂O排放通量。得到以下研究结果:灌溉施肥后,各处理N₂O平均排放通量与表层土壤硝态氮含量呈极显著正相关关系。灌溉施肥后7 d内是施氮处理土壤N₂O主要排放期,其排放量占当季总排放量的55.9%~59.8%;峰值一般出现在第3~5 d,此时的土壤含水量对硝化、反硝化作用都较适宜。8~10月份由于温度较高,N₂O排放通量明显高于较冷的11~12月。8~10月份施氮是影响保护地土壤N₂O排放的主导因素,减少施氮量显著降低了N₂O排放量;之后温度是主导因素,此时N₂O排放量受追施氮量的影响较小。经估算,保护地秋冬季番茄不同施氮处理N₂O总排放量的大小顺序为:N900(N 5.304 kg/hm²)>N675(N 3.616 kg/hm²)>N0(N 0.563 kg/hm²),差异显著,减量施氮比习惯施氮处理降低了31.8%的N₂O排放量;N675和N900处理的N₂O排放系数分别为0.45和0.53。

关键词: N₂O 保护地菜地土壤 氮肥 灌溉

Abstract: This study was conducted to determine the effect of different N fertilization rates on N₂O emissions from a loamy fluvo-aquic soil in North China Plain in 2009. Fluxes of N₂O were measured on greenhouse cropped with tomatoes (*Lycopersicon esculentum*) with split application of 675 or 900 kg/hm² N from Aug 7th to Dec 25th. An unfertilized plot planted with tomatoes as control was also set up. The results indicated that total emission increased with the N application rate. The mean N₂O emission rate from the differently management plots was closely correlated to the mean soil nitrate content in surface soil after topdressing (R²=0.810). The peak of N₂O emission generally occurred within 3–5 days after N application, and more than 50 per cent of total N₂O emissions occurred over the first 7 days after fertilization. The N emission from the unfertilized treatment was N 0.56 kg/ha. Total N₂O emission from the fertilized crops for the low and the conventional rates of N fertilization were N 3.616 and 5.304 kg/ha, respectively. The high N₂O emissions from greenhouse tomatoes plots were due to high N₂O losses from the fertilized treatments during the summer and early autumn (Aug, Sept and Oct) and high soil nitrate contents after the N application. The reduction of N fertilization resulted in decreased N₂O emissions during the warmly period. However, the emissions during the winter were not affected by the rate of N fertilization. The results show that the N application management in greenhouse had a great influence on the N₂O emissions. It also affected the emissions per unit N fertilizer applied (low and the conventional rates of N fertilization were 0.45 and 0.53).

Keywords: N₂O emission greenhouse vegetable soil nitrogenous fertilizer irrigation

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