

施氮对春玉米氮素利用及农田氮素平衡的影响

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Effect of N application on N utilization and N balance in spring maize

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摘要

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摘要 田间试验研究了玉米对不同土壤氮素供应水平下作物氮素吸收利用、土壤氮素供应以及农田氮素平衡的影响。结果表明, 玉米产量随施氮量的增加而显著提高, 当施氮量高于N 240 kg/hm²时, 产量有减少趋势; 氮素当季利用率随施氮量的增加逐渐降低。土壤中硝态氮含量在玉米整个生育时期呈现先迅速下降后缓慢升高的趋势; 玉米成熟期, 施氮处理的各层土壤中硝态氮含量显著高于不施氮处理, 各层硝态氮含量基本随施氮量的增加而升高。适量施氮促进玉米对氮素的吸收和利用, 进而提高玉米生物量和产量; 过量施氮导致硝态氮在土壤中大量累积, 提高了硝态氮淋溶风险。施氮处理显著提高了收获后土壤中残留无机氮(N_{min}), 土壤残留N_{min}随施氮量的增加而增加; 当施氮量高于N 240 kg/hm²时, 残留N_{min}有下降趋势。氮素表现损失随施氮量的增加而增加。在本试验条件下, 综合产量、氮肥利用率和土壤硝态氮累积情况考虑, 合理施氮量应控制在N 180~240 kg/hm²左右。

关键词: 春玉米 施氮量 土壤硝态氮 氮肥利用率

Abstract: Field experiment was carried out to investigate N application on plant N uptake and utilization, soil N supply and N balance in spring maize. Results obtained showed that, maize yield increased significantly with the increment of N application rate, and with the trend of decreasing when the nitrogen application rate was higher than N 240 kg/ha. N recovery efficiency decreased with the N application rate. Nitrate content in the soil profile throughout the growth stages showed the trends of decreasing rapidly first, and then rose slowly. Nitrogen application significantly increased nitrate content in all layers of soil profile, and nitrate content rose with N application rate. Appropriate rate of nitrogen promoted plant N uptake and utilization, and plant biomass and yields as well. Over use of N resulted in luxury nitrate accumulation in soils, and therefore enhanced the risk of nitrate leaching into the underground water. At harvest, nitrogen application significantly increased residue mineral N (N_{min}) in soils. The residue N_{min} in soils rose with N application rate, but the value decreased when N application rate was over N 240 kg/ha. Under the experimental conditions, with the consideration of yield, nitrogen utilization and soil nitrate accumulation, a reasonable amount of nitrogen application should be controlled at about N 180-240 kg/ha.

Keywords: maize N application soil NO₃-N N recovery efficiency

Received 2009-04-27;

Fund:

国家重点基础研究发展计划课题(2007CB109306); 国家科技支撑计划课题(2006BAD02A10); 沃土工程关键支撑技术研究(2006BAD25B05)资助。

引用本文:

叶东靖, 高强, 何文天, 何萍. 施氮对春玉米氮素利用及农田氮素平衡的影响[J] 植物营养与肥料学报, 2010, V16(3): 552-558

YE Dong-Jing, GAO Qiang, HE Wen-Tian, HE Ping. Effect of N application on N utilization and N balance in spring maize[J] Acta Metallurgica Sinica, 2010, V16(3): 552-558

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