应用生态学报 2005 16 (03): 496-500 ISSN: 1001-9332 CN: 21-1253/Q

研究报告

元素硫和双氰胺对蔬菜地土壤硝态氮淋失的影响

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收稿日期 2004-7-12 修回日期 2004-12-1 网络版发布日期 接受日期

摘要

采用温室盆栽淋洗试验，以NH_4HCO_3为氮肥源，研究了元素硫(S_0)和双氰胺（DCD）对种葱和不种作物土壤NO_3^--N淋失量和NO_3^--N、NH_4^+-N浓度的影响.结果表明,在12周试验期间，与对照相比，S_0+DCD和S_0处理NO_3^--N淋失量分别低83%～86%和83%；NH_4^+-N淋失量分别高16.8～21.0 mg·盆$^{-1}$ 和20.4～25.0 mg·盆$^{-1}$ ；而同期无机氮（NO_3^--N、NH_4^+-N）淋失量则低60%.试验结束后，，S_0+DCD和S_0处理土壤无机氮含量分别比对照高79.9%～85.4%和74.9%～82.6%，以NH_4^+-N为主.S_0+DCD处理无机氮淋失量比S_0和DCD处理分别低4.6%～14.4%和15.4%～30.1%；试验结束后土壤无机氮分别高6.1%和16.8～36.0%.在$Na_2S_2O_3$+DCD、$Na_2S_2O_3$和DCD处理中也发现类似结果.可见S_0施入土壤具有与DCD同样的氨稳定和硝化抑制作用.S_0与DCD配合施用可使DCD的硝化抑制性增强，其作用机理是S_0氧化中间体$S_2O_3^{2-}$ 、$S_4O_6^{2-}$,具有抑制硝化和DCD降解作用，延缓DCD硝化抑制效果.S 0与DCD配合施用可用于延缓太湖流域蔬菜地土壤NH_4^+-N向NO_3^--N转化，减少氮向水体迁移风险.

关键词 元素硫；蔬菜地土壤；硝态氮；硝化抑制剂

分类号

Effects of elemental sulphur and dicyandiamide on mitigating NO_3^--N leaching loss from vegetable soil

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Abstract

In a pot experiment with allium as test plant and NH_4HCO_3 as nitrogen source,this paper studied the effects of element sulphur（S_0）and dicyandiamide (DCD) on mitigating the NO_3^--N leaching loss from soil and on soil inorganic nitrogen (NO_3^--N and NH_4^+-N) content.The results showed that within the 12 weeks of the

experiment,the cumulative leaching loss of soil NO_3^--N in treatments S_0+DCD and S_0 was 83%～86% and 83% lower,while that of soil NH_4^+-N was 16.8～21.0 mg·pot^{-1} and 20.4～25.0 mg·pot^{-1} higher than CK,respectively,and the cumulative loss of soil (NH_4^++NO_3^-)-N was 60% lower.By the end of the experiment,soil inorganic nitrogen content in treatments S_0 +DCD and S_0 was 79.9%～85.4% and 74.9～82.6% higher than CK,respectively.The cumulative leaching loss of inorganic N in treatment S_0 +DCD was 4.6%～14.4% and 15.4%～30.1% lower,and the soil inorganic nitrogen content by the end of the experiment was 6.1% and 16.8%～36.0% higher than that of treatments S_0 and DCD,respectively.Similar results were obtained when S_0 was replaced by $Na_2S_2O_3$,but not by Na_2SO_4.The fact that the application of S_0 could obviously decrease the NO_3^--N leaching loss from soil could be contributed to the inhibitory effects of $S_2O_3^{2-}$ and $S_4O_6^{2-}$ originated from S_0 oxidation in soil on the nitrification of NH_4^+-N.S_0 could retard the decomposition of DCD due to the effect of its oxidized products $S_2O_3^{2-}$ and $S_4O_6^{2-}$,and thus,extend the inhibitory effect of DCD on NH_4^+-N nitrification.It is suggested that S_0 combined with DCD could be used as an effective nitrification inhibitor to control the NO_3^--N leaching loss from vegetable soils.

Key words Element sulphur Vegetable soil Nitrate Nitrification inhibitor

DOI:

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