

化肥有机肥配合施用下双季稻田氮素形态变化

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Dynamics of nitrogen in double-rice paddy soil under application of chemical fertilizer combined with manure

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摘要

为揭示有机无机肥配合施用下稻田氮素的动态及迁移特征, 在湖南双季水稻农作区第四纪红土发育的红黄泥稻田上进行了连续6年田间试验。通过比较不施氮肥(PK)、施用有机肥猪粪(M)、化肥(NPK)及有机化肥配合(NPKM), 研究稻田表层全氮、无机氮动态变化, 不同层次(25—30、55—60、85—90 cm)土壤溶液无机氮动态, 耕层土壤无机氮动态等。结果表明, NH₄⁺-N是红壤双季稻田无机氮素存在的主要形态, 施用化学肥料处理(NPK)施肥后1~3 d表面水NH₄⁺-N浓度占全氮比例可达0.5~0.9, 有机肥处理(M)为0.3左右。不同层次土壤溶液及其土壤氮素浓度呈现一致的特征, 即施肥后短期内出现浓度峰值随后迅速下降, 且随着往下推移, 氮素峰值出现时间延长, 表层水全氮及无机氮在施肥后1~2 d出现浓度高峰, 耕层土壤及25—30 cm土壤溶液无机氮浓度高峰约在施肥后3~5 d。化肥有机肥配施有利于水稻稳产高产, 年产量达12.2 t/hm², 比不施氮肥的对照产量(7.3 t/hm²)增加68%; 土壤有机质6年提升18.5%, 显著高于化肥。施用有机肥(M)及有机无机肥配合(NPKM)显著降低了稻田表层水全氮及不同层次土壤溶液和耕层土壤NH₄⁺-N峰值浓度, 提高水稻产量和培肥土壤, 有利于减少当前氮肥过量施用带来的环境负荷。

关键词: 稻田 氮素动态 有机无机肥配合 稻田 氮素动态 有机无机肥配合

Abstract:

A six year field experiment was conducted in Quaternary Period red clay soil in double rice region of south Hunan province. Its purpose was to disclose dynamics and transferred characteristics of nitrogen under the application of chemical fertilizer combined with manure. Four treatments, namely, no nitrogen (PK), swine manure (M), chemical fertilizer (NPK) and swine manure applied combined with chemical fertilizer (NPKM) were selected to study the dynamics of total nitrogen and inorganic nitrogen in surface water, and as well as the dynamics of inorganic nitrogen in soil solution in different layers (25-30, 55-60 and 85-90cm) and tillage soil. The results show that NH₄⁺-N is the predominant inorganic nitrogen in red double rice paddy soil, and the ratio of NH₄⁺-N/total N reaches to 0.5-0.9 in surface water within 1-3days after chemical fertilizer (NPK treatment) applied, while that of organic manure treatment is about 0.3. The peak values of nitrogen concentration are detected within 1-2 days in surface water and 3-5 days in soil solution in different layers after fertilizer application. The peak values of nitrogen concentration in surface water, in soil solution and in tillage soil are lower in organic manure (M), and chemical fertilizer applied combined with organic manure (NPKM) treatments than those of the other two treatments. The NPKM treatment achieves a 12.2 t/hm² mean annual yield (68% higher than that of PK). The soil organic matter in tillage soil is increased by 18.5% during the six-year plantation at the NPKM which is significantly higher than that of the NPK treatment. Application of chemical fertilizer combined with organic manure is propitious to reduce environment load due to excessive chemical nitrogen applied.

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