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研究报告

控释氮肥对洞庭湖区双季稻田表面水氮素动态及其径流损失的影响

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摘要 用渗漏池模拟洞庭湖区2种主要稻田土壤(河沙泥和紫潮泥)，研究了施用尿素(CF)和控释氮肥(CRNF)对双季稻田表面水pH、电导率(EC)、全氮（TN）、铵态氮（NH_4^+-N）和硝态氮（NO_3^--N）浓度变化规律及TN径流损失的影响. 结果表明，双季稻田施用尿素后，表面水TN、NH_4^+-N浓度分别在第1、3天达到高峰，然后迅速下降；NO_3^--N浓度普遍很低；早稻表面水pH在施用尿素后15 d内(晚稻3 d)逐渐升高；EC与NH_4^+动态变化一致. 与尿素相比，施用CRNF能显著降低双季稻田表面水pH、EC、TN和NH_4^+-N浓度，70% N控释氮肥的控制效果最显著；但后期NO_3^--N浓度略有升高. 径流监测结果表明，洞庭湖区种植双季稻期间施用尿素的TN径流损失为7.70 kg·hm^{-2}，占施氮量的2.57%；施肥后20 d内发生的径流事件对双季稻田TN径流损失的贡献极为显著；与施用尿素相比，施用控释氮肥显著降低了施肥后10 d内发生的第1次径流液中的TN浓度，施用CRNF和70%N CRNF的氮素径流损失分别降低24.5%和27.2%.

关键词 控释氮肥 双季稻田 表面水 氮素 径流损失

分类号

Effects of controlled release nitrogen fertilizer on surface water N dynamics and its runoff loss in double cropping paddy fields in Dongtinghu Lake area.

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Abstract

By using leakage pond to simulate the double cropping paddy fields in Dongtinghu Lake area, this paper studied the effects of urea (CF) and controlled release nitrogen fertilizer (CRNF) on the dynamics of surface water pH, electrical conductivity (EC), total nitrogen (TN), ammonia nitrogen (NH_4^+-N) and nitrate nitrogen (NO_3^--N) and the runoff loss of TN in alluvial sandy loamy paddy soil and purple calcareous clayed paddy soil, the two main paddy soils in this area. The results showed that after applying urea, the surface water TN and NH_4^+-N concentrations reached the peak at the 1st and 3rd day, respectively, and decreased rapidly then. Surface water NO_3^--N concentration was very low, though it showed a little raise at the 3rd to 7th day after applying urea in purple calcareous clayed paddy soil. In early rice field, surface water pH rose gradually within 15 days after applying urea, while in late rice field, it did within 3 days. EC kept consistent with the dynamics of NH_4^+-N. CRNF, especially 70%N CRNF, gave rise to distinctly lower surface water pH, EC, and TN and NH_4^+-N concentrations within 15 days after application, but NO_3^- concentration rose slightly at late growth stages, compared with urea application. The monitoring of TN runoff loss indicated that during double cropping rice growth season, the loss amount of TN under urea application was 7.70 kg·hm^{-2}, accounting for 2.57% of applied urea-N. The two runoff events occurred within 20 days after urea application contributed significantly to the TN runoff loss. CRNF application resulted in a significantly lower TN concentration in runoff water from the 1st runoff event occurred within 10 days of its application, and thereafter, the total TN runoff loss for CRNF and 70% N CRNF application was decreased by 24.5% and 27.2%, respectively, compared with urea application.

Key words controlled release nitrogen fertilizer double cropping paddy field surface water nitrogen runoff loss

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