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配施猪粪对麦季CH_4和N_2O排放及温室效应的影响

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Effects of Applicaion of Pig Manure in Combination With Chemical Fertilizers on CH_4 and N_2O Emissions and Their Greenhouse Effects in Wheat Field

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摘要 参考文献 相关文章

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摘要 采用遮光密闭箱和气相色谱法研究配施猪粪条件下麦季CH_4和N_2O的排放特征，并运用全球增温潜势（P_{GW}）对麦田CH4和N2O排放的温室效应进行估算。结果表明，常规施肥、秸秆还田、50%猪粪和100%猪粪替代化肥处理CH_4平均排放通量分别为6.10、10.26、5.32和2.35μg · m^{-2} · h^{-1}，N_2O平均排放通量分别为24.25、38.24、12.21和16.06μg · m-2 · h^{-1}。CH_4排放通量在拔节后随温度升高而增加，N_2O排放主要发生在苗期灌溉或降水后。与常规施肥相比，100%猪粪和50%猪粪替代化肥处理麦季CH_4和N_2O排放产生的总P_{GW}分别降低34.3%和48.9%，单位产量的P_{GW}分别降低26.0%和48.9%，秸秆还田措施的P_{GW}及单位产量的P_{GW}分别提高57.9%和52.0%。然而，与常规施肥与秸秆还田处理相比，100%猪粪处理的小麦产量显著降低（$P<0.05$）。试验结果表明，在作物高产、稳产要求下，50%猪粪替代化肥措施的减排效果较好。

关键词： 猪粪 化肥 温室气体 小麦

Abstract: Characteristics of CH_4 and N_2O emissions from wheat fields applied with pig manure in combination with chemical fertilizers were studied using the static chamber method and gas chromatography, and greenhouse effect of the CH_4 and N_2O emitted from the fields were assessed using global warming potentials (P_{GW}). Results show that the average CH_4 flux from Treatment NPK (the plots applied with chemical fertilizer as in conventional practice), Treatment NPKS (the plots applied with chemical fertilizer plus straw), Treatment 50% PM (the plots applied with half pig manure and half chemical fertilizer) and Treatment 100% PM (the plots applied with pig manure only) was 6.10, 10.26, 5.32 and 2.35 μg•m^{-2}•h^{-1}, respectively, the average N_2O flux from Treatments NPK, NPKS, 50% PM and 100% PM was 24.25、38.24、12.21 and 16.06 μg•m^{-2}•h^{-1}, respectively. It was found that CH_4 flux increased with temperature after the elongation stage, and N_2O emissions occurred mainly after irrigation or rain during the seeding stage. Compared to Treatment NPK, Treatment NPKS was 57.9% and 52.0% higher in P_{GW} and P_{GW} per yield, respectively, while, Treatment 100% PM was 34.3% and 26.0% lower and Treatment 50% PM 48.9% and 48.9% lower in P_{GW} and PGW per yield, respectively.However,compard with Treatments NPK and NPKS,Treatment 100% PM was significantly lower in wheat yield. It is, therefore, concluded that Treatment 50% PM, that is, to replace half of the rate of chemical fertilizer applied in conventional practice with pig manure, is a good option to reduce CH_4 and N_2O emissions from wheat fields without significant yield reduction.

Keywords: manure chemical fertilizer greenhouse gas wheat

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