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长期有机养分循环利用对红壤稻田土壤供氮能力的影响

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Effects of long-term cycling of organic nutrient on soil nitrogen supplying capacity in a red soil paddy ecosystem

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摘要 | 参考文献 | 相关文章

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摘要 通过15年的田间定位试验结合盆栽试验,研究了长期有机养分循环利用和不同化肥配施对红壤稻田土壤供氮能力的影响。结果表明,土壤有机碳、全氮、微生物生物量氮(MB-N)和土壤氮的矿化量与生物吸氮量有极显著的正相关关系,是良好的土壤供氮能力指标。长期有机养分循环利用或配合化肥施用能显著提高土壤有机碳、全氮含量和氮的矿化量,提高幅度分别为20.1%4～0.9%、0.460～.60.g/kg和55.0%(6周);明显提高土壤MB-N含量,提高幅度平均为70.3%。长期纯化肥处理对土壤碳、氮库的积累和氮的矿化量的提高作用甚微。盆栽试验表明,长期施用氮肥和氮、磷、钾肥土壤供氮量提高量极小,与长期不施肥相比提高幅度分别为2.1%和6.2%,而有机养分循环利用能显著提高土壤供氮量,提高幅度为33.7%8～9.0%。随着有机养分循环利用和NPK肥配合程度的提高,土壤供氮量提高幅度呈上升的趋势。

关键词： 红壤性水稻土 有机养分循环利用 供氮能力 红壤性水稻土 有机养分循环利用 供氮能力

Abstract： Nitrogen supplying capacity played an important role in growth and yield of rice.In order to obtain efficient nitrogen and organic nutrient utilization and reduce the possible environmental effects,it is essential to determine the fertilization model which is based on the soil nitrogen supplying capacity.A pot experiment based on long-term field experiment was conducted to determine the effects of long-term cycling of organic nutrient or application of chemical fertilizer on soil in total nitrogen,soil organic carbon,mineralizable nitrogen,microbial biomass nitrogen and carbon content,nitrogen uptake by rice.The field experiment was carried out on a reddish paddy soil in taoyuan,Hunan,during 1990-2004,8 treatments(CK,N,NP,NPK,C,N+C,NP+C,NPK+C) and three replicates were set up.Levels of fertilization were N 182.3 kg/ha,P 39.3 kg/ha,K 197.0 kg/ha after 1997(N 262.5 kg/ha,P 39.3 kg/ha,K 137.0 kg/ha before 1997).For some treatments with recycling of crop nutrients,rice straw was fully returned to the field after harvesting,80% of full grains (50% after 1995) and all of the empty or blighted grains were fed to pigs,and the pig manure subsequently was spread in the field,and the last step was that the Chinese milk vetch was cultivated in winter and then ploughed into the field before spring plowing.The pot experiment was carried out in taoyuan(2004),level of fertilization were NaH_2PO_4 0.26 g/pot,KCl 0.27 g/pot.The results indicated that there was a significant positive relationship among soil organic carbon,total N,amount of mineralizable N,the microbial biomass N(MB-N) and N uptake of rice,and they were good indicators of soil nitrogen supplied capacity.The recycling application of organic nutrient or application combined with chemical fertilizer significantly increased soil organic carbon content,total nitrogen content and amount of net N mineralization(6 weeks) by 20.1%～40.9%,0.46～0.60 g/kg and 55.0%,respectively;And it obviously increased soil MB-N content by 70.3%.However,there was less effect of chemical fertilizer application on the content of soil nitrogen,soil carbon and mineralizable N.The pot experiment indicated that compared with zero application of fertilizer,there were significant effects of long-term recycling application of organic nutrient on the soil nitrogen supply capacity,and the amount of nitrogen uptake by rice increased by 33.7%～89.0%, while there was less effects of application of chemical fertilizer N and NPK,which only increased by 2.1% and 6.2%.Additionally,soil nitrogen supplying capacity increased with the combination degree between the recycling application of organic nutrient and fertilizer NPK enhancement.

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