

有机无机肥配施对蔬菜轮作系统重金属污染和产品质量的影响

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Risk of heavy metal pollution and product quality in tomato-radish-green grocery cropping system under applications of commercial organic manure and chemical fertilizers

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摘要

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摘要 采用田间试验方法,研究了等氮、磷、钾量条件下,单施化肥和禽畜商品有机肥与化肥配合施用对番茄—萝卜—青菜轮作系统中的重金属污染和农产品质量的影响。结果表明,中、低量有机肥与化肥配合施用(T2和T3)使蔬菜作物轮作试验中第一季作物番茄的果实产量显著降低,但无机有机肥配施处理使后续作物萝卜和青菜的产量高于单施化肥处理。不同施肥处理番茄果实和青菜地上部的重金属含量和积累量没有显著差异,低量和中量有机肥与化肥配施处理(T2和T3)萝卜肉质根铅含量和所有有机无机肥配施处理(T2、T3和T4)的铅积累量显著低于单施化肥处理。各处理蔬菜可食部分的镉、铅含量均低于食品中污染物限量标准(GB18406.1—2001)。单施化肥会引起铜的亏缺,配施商品有机肥可有效地减少土壤中铅的积累。因此适量有机肥与化肥配合施用可在一定程度上防止铜和锌等微量营养元素的亏缺,也可有效地降低重金属铅、镉的污染。

关键词: 商品有机肥 配合施肥 番茄—萝卜—青菜轮作系统 重金属污染风险 产品质量

Abstract: A Field experiment was conducted to assess the impacts of chemical fertilizers and integrated fertilization with commercial organic manure made from feces of domestic animals and chemical fertilizers on the risk of heavy metal pollution in tomato-radish-greens cropping system. The dosages of N, P₂O₅, and K₂O of all treatments were set to equal. The results indicate that the fruit yield of tomato plants as the first season crop was reduced significantly ($p < 0.05$) in the treatments applied with lower and medium rates of organic manure and chemical fertilizers, while the yields of radish and green grocery as the following crops were increased in the treatments applied with organic manure. It was found that the differences of copper, zinc, cadmium and lead concentrations and accumulations in tomato fruit and green grocery shoot were not significant ($p > 0.05$). Lead concentrations in radish flesh root of the treatments with lower and medium rates of organic manure were significantly lower than that with chemical fertilizers, and Lead accumulations in radish flesh root of the treatments with organic manure were significantly lower than that with chemical fertilizers. Cadmium and lead concentrations in edible parts of vegetable crops of all treatments were lower than the limits of these heavy metals in foods (GB18406.1—2001). Copper was deficit in soil-crops system with chemical fertilizers, and lead accumulations were decreased apparently in the treatments applied with organic manure. These results implied that integrated fertilization could not only remain the balance of zinc and copper as micronutrients, but also minimize the risk of heavy metal pollution in the cropping system.

Keywords: Commercial organic manure integrated fertilization tomato-radish-green grocery cropping system risk of heavy metals product quality

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