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不同畜禽粪与化肥配施对黑土中Cu有效性的影响及相关因素分析

Effects of different combinations of livestock manures with chemical fertilizers on Cu availability in black soil and relevant factors analysis关键词: [畜禽粪](#) [Cu有效性](#) [黑土](#) [相关因素](#)基金项目: [国家科技支撑计划项目\(No.2013BAC09B01.2012BAD14B05\)](#); [吉林省科技厅重点科技成果转化项目\(No.20130303035NY\)](#)

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摘要: 本文通过培养试验,研究了不同畜禽粪与化肥配施对黑土中Cu总量及形态3年内动态变化的影响,并对影响Cu形态变化的相关因素进行了分析.研究结果显示:不同畜禽粪与化肥配施增加了土壤中Cu的总量,增加效果依次为:猪粪与化肥配施>鸡粪与化肥配施>牛粪与化肥配施.不同畜禽粪与化肥配施导致了土壤中各形态Cu含量增加,增幅依次为:猪粪与化肥配施>鸡粪与化肥配施>牛粪与化肥配施.此外,不同畜禽粪与化肥配施还导致了土壤中酸可提取态Cu和残渣态Cu比例增加,可还原态Cu和可氧化态Cu比例减少,变化幅度均呈现猪粪与化肥配施>鸡粪与化肥配施>牛粪与化肥配施的规律.由于酸可提取态Cu占全Cu比例较小(增加后比例仍不足2%),故其对Cu有效性的影响微乎其微,而残渣态Cu的增加,可还原态、可氧化态Cu的减少均表明:不同畜禽粪与化肥配施降低了土壤中Cu的有效性.对于影响Cu形态的相关因素分析,研究表明:土壤中各形态Cu与pH值间相关性不显著,但其与有机质含量间相关性极其显著.酸可提取态、残渣态Cu与有机质含量呈显著负相关,可还原态、可氧化态Cu与有机质含量呈显著正相关.此外,畜禽粪与化肥配施增加了土壤中各形态Cu与pH值间的相关性,但对其与有机质含量间关系影响不大.

Abstract: A 3-year culture experiment was used to study effects of different combinations of livestock manures with chemical fertilizers on the dynamic changes of morphology of Cu in black soil. Relevant factors influencing the morphology of Cu were also analyzed in this paper. The results showed that different combinations of livestock manures with chemical fertilizers increased the total Cu amount in the soil with the order of pig excrements >chicken manures >cow dung >fertilizers only. The combined applications increased all Cu morphological fractions contents with the order of pig excrements >chicken manures >cow dung >fertilizers only. In addition, the combined applications led to an increase of weak acid soluble fraction and residual fraction of Cu, decreased reducible fraction and oxidisable fraction of Cu with the order of pig excrements >chicken manures >cow dung >fertilizers only. Because the proportion of weak acid soluble fraction was too low (less than 2% even after increase), it had almost no influence on the effectiveness of Cu. The increase of residual fraction and the decrease of the reducible fraction and oxidisable fraction indicated that combined applications decreased the effectiveness of Cu. As for the relevant factors influencing the fractions of Cu, the results showed that the morphological fractions of Cu had no significant correlation with pH, but showed a significant correlation with organic matters content in soil. The weak acid soluble fraction and residual fraction showed a significantly negative correlation with organic matters, and the reducible fraction and oxidisable fraction showed a significantly positive correlation with organic matters. Moreover, the combined applications increased the correlation between Cu and pH but had no influence between Cu and organic matters.

Key words: [livestock manure](#) [Cu availability](#) [black soil](#) [relevant factor](#)

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