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锌污染对猪粪堆肥过程中氧化还原类酶活性的影响 

Effects of Zn pollution on oxidoreductase activity during pig manure composting

关键词: [猪粪](#) [锌](#) [理化性质](#) [氧化还原酶活性](#)

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摘要: 以猪粪和秸秆为主要试验材料,添加不同浓度重金属Zn,采取发酵罐处理方法,在好氧高温条件下,研究了重金属锌污染对猪粪堆肥过程中多酚氧化酶、脱氢酶活性的影响,以及对堆腐过程堆体温度、堆料pH值、胡敏酸 E_4/E_6 值的影响.结果表明:①CK以及低量重金属Zn污染的堆料升温快,高温期持续时间长,达到无害化处理.②Zn含量为 $600 \text{ mg} \cdot \text{kg}^{-1}$ 和 $900 \text{ mg} \cdot \text{kg}^{-1}$ 的堆料 E_4/E_6 平均值小,有利于腐殖质的缩合和芳构化.③Zn含量为 $600 \text{ mg} \cdot \text{kg}^{-1}$ 的堆料多酚氧化酶平均活性、脱氢酶平均活性最高,有助于堆料中木质素的降解及其产物的转化、微生物生长繁殖.④Zn含量为 $300 \text{ mg} \cdot \text{kg}^{-1}$ 、 $600 \text{ mg} \cdot \text{kg}^{-1}$ 、 $900 \text{ mg} \cdot \text{kg}^{-1}$ 的堆料对pH有较强的控制能力,其脱氢酶活性均表现出一定的不稳定性,可能是重金属对脱氢酶活性有抑制作用的同时发生"抗性酶活性现象".

Abstract: The changes of polyphenoloxidase and dehydrogenase activities, and the changes of composting temperatures, pH and humic acid E_4/E_6 of composting materials during aerobic fermentation in thermophilic aerobic state were studied. Pig manure and straw were used as the main experimental materials. There were five treatments in this experiment. The results showed that: ① The temperature of CK and the treatment which added low concentration of Zn raised quickly, and the high temperature duration lasted long and reached the requirement of the harmlessness; ② The average of E_4/E_6 of the treatments which added $600 \text{ mg} \cdot \text{kg}^{-1}$ and $900 \text{ mg} \cdot \text{kg}^{-1}$ were low, and facilitated the Condensation and aromatization of humus; ③ The polyphenoloxidase and dehydrogenase activities of the treatment which added $600 \text{ mg} \cdot \text{kg}^{-1}$ were the highest, and beneficial to the decomposition of lignin, the conversions of products, and the growth and breeding of microorganism; and ④ The treatments which added $300 \text{ mg} \cdot \text{kg}^{-1}$ 、 $600 \text{ mg} \cdot \text{kg}^{-1}$ 、 $900 \text{ mg} \cdot \text{kg}^{-1}$ had powerful ability on controlling pH, the dehydrogenase activities exhibited instability in the whole composting process. Zn may have inhibitory effect on dehydrogenase activity and resistive enzyme activity phenomenon may occur at the same time.

Key words: [pig manure](#) [Zn](#) [physicochemical properties](#) [oxidoreductase activities](#)

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