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CHANGES OF ARSENIC SPECIATION DURING SWINE MANURE WINDROW COMPOSTING AT FULL SCALE

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Abstract

Organoarsenic compounds are used extensively as swine feed-additives to promote animal growth and control diseases, e.g. roxarsone (4-hydroxy-3-nitrobenzenearsonic acid) and arsanilic acid (4-aminophenylarsonic acid) are usually overused in swine industry in China. As a cost-effective technology for animal manure treatment and reuse, composting is widely used for swine manure treatment. Therefore, the purpose of this study was to investigate changes of arsenic species and fractions during a full scale swine manure windrow composting. Results showed that four arsenic species, arsenite (As (III)), arsenate (As (V)), monomethylarsonate (MMA) and dimethylarsinate (DMA), were detected and varied differently which arsenate was on a slightly increasing trend and arsenite presented a decreasing trend throughout the composting process. The percentages of arsenite, arsenate and DMA were 24.10%, 29.68%, 4.87% of total arsenic in the beginning of the composting and 8.19%, 34.13%, 4.75% of total arsenic respectively at the end of the composting. Arsenate had the similar trend to Fe/Mn oxides arsenic fraction, which decreased dramatically in the first 10 days and then was on increasing trends during the rest of the composting. The percentages of Fe/Mn oxides, residual, carbonates, organic arsenic fractions were 55.3%, 25.9%, 18.6%, 0% in the beginning and 46.6%, 22.7%, 19.1%, 11.5% at the end of the composting, respectively. These results demonstrated that the most toxic arsenic species, arsenite, was declined dramatically during the composting process, and composting was a suitable method for detoxification of arsenic by changing their forms.

Key words: arsenic fraction, arsenic species, composting, swine manure

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