



Effect of clay on greenhouse gas emissions and humification during pig manure composting as supported by spectroscopic evidence

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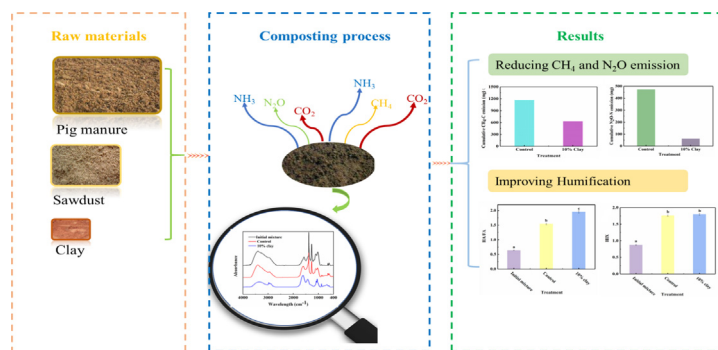
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HIGHLIGHTS

- Clay was applied into mixture of pig manure and sawdust for composting.
- Clay prolonged thermophilic phase and promoted the degradation of organic matter.
- Adding clay reduced the emission of CH₄ and N₂O.
- Clay stimulated the formation of aromatic-carbon and improved the humification.
- Adding clay increased the humic acid/fulvic acid ratio and humification index.

GRAPHICAL ABSTRACT



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ABSTRACT

To evaluate the effect of clay on greenhouse gas (GHGs) emissions and humification during pig manure (PM) composting, two lab-scale composting experiments, a control and a 10% clay treatment, were established. The results showed that adding clay reduced the emissions of CH₄ and N₂O by 45.88% and 86.79%, respectively, promoted the degradation of organic matter (OM) and facilitated the synthesis of humic acid (HA). The spectrum of dissolved organic matter (DOM) indicated that adding clay promoted the formation of aromatic carbon compounds and the degradation of aliphatic carbon. Furthermore, compared with the control, the spectral parameters including the specific UV absorbance at 254 nm (SUVA₂₅₄), the specific UV absorbance at 280 nm (SUVA₂₈₀) and the ration of the area at 435–480 nm and at 300–345 nm (A₄/A₁) of DOM were increased by 5.45%, 3.66% and 29.26%, respectively. Combined with the excitation-emission matrix (EEM) and the percentage fluorescence response (Pi,n), the clay amendment promoted the decomposition of tyrosine and Tryptophan and the formation of humic-like substances, and thus increased humification. The variation in the HA/fulvic acid and the humification index confirmed these results. Therefore, clay amendment is beneficial for reducing GHG emissions, promoting humification and aromatization during pig manure composting.

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