Effect of temperature on thermophilic composting of aquaculture sludge: NH_3 recovery, nitrogen mass balance, and microbial community dynamics

ABSTRACT

Development of thermophilic composting for maximizing NH_3 gas recovery would enable the production of a nitrogen source which is free from pathogen/heavy metal, for the cultivation of high-value microalgae. The present study examined the effect of NH_3 recovery, nitrogen mass balance, and microbial community dynamics on thermophilic composting of shrimp aquaculture sludge. The emission of NH_3 gas at 60 and 70 °C was 14.7% and 15.6%, respectively, which was higher than that at 50 °C (9.0%). The nitrogen mass balance analysis revealed that higher temperatures enhanced the solubilization of non-dissolved nitrogen and liberation of NH_3 gas from the produced NH_4^+-N. High-throughput microbial community analysis revealed the shift of the dominant bacterial group from *Bacillus* to *Geobacillus* with the rise of composting temperature. In conclusion, thermophilic composting of shrimp aquaculture sludge at 60–70 °C was the most favorable condition for enhancing NH_3 gas recovery.

Keyword: Aquaculture sludge; Composting; Ammonia gas recovery; Next-generation sequencing