

Design of Thermal Post-Treatment Unit for the Inactivation of Pathogens in Compost after the Composting Process for Food Production

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Abstract

The safe disposal of human waste is a basic requirement to improve sanitation and protect public health. The composting toilets system was adopted to improve sanitation and to boost food production in rural communities of Burkina Faso. In this system, the toilet produce compost from faeces which is separately collected from urine and composting matrix (sawdust). The compost still contains pathogens because there is a short retention time between the final defecation and emptying. There is low temperature (35 °C) in the composting toilet. There is a need for a post-treatment unit to ensure complete inactivation of pathogens that are found in the compost after withdrawal. This complies with the multi-barrier concept recommended by WHO (2006). The aim of this study is to design the post-treatment unit which would treat the compost removed from the composting toilet to allow a safe reuse on farmlands. The inactivation rate coefficients of indicator pathogens i.e. *Escherichia coli*, *Enterococcus*, *Ascaris suum* eggs and *MS2 bacteriophage* in the compost were estimated. The kinetics of inactivating pathogens were determined at different temperatures with varying moisture content of the compost. The results of these experiments are as follows: *E. coli* requires post-treatment conditions of 50 °C and 50% MC and a contact time over 4.5 h or post-treatment conditions of 70 °C, 50% MC for 20 min. *Enterococcus* requires a post-treatment condition of 50 °C and 50% MC during 15 h or 70 °C, 50% during 2.5 h. The inactivation of *Ascaris suum* was fast with greater than 2 log reductions achieved within 2 hours at 50 °C and 50% and greater than 3 log reductions at 60 °C and 50% during 3 hours. The statistical analysis showed that the inactivation rates of *Ascaris suum* eggs significantly depends on higher temperature (i.e., 60 °C) and lower MC (i.e. 50%) of the compost. The inactivation rate coefficients of *MS2 bacteriophage* statistically depended on a higher temperature, but not moisture content.

Keywords: Pathogens; composting toilet; temperature; post-treatment; health risk assessment

References

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