



**Hungarian University of Agriculture and Life Sciences
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Institute of Environmental Sciences

BSc Environmental Engineering

**Ammonia and Greenhouse Gas Emissions from Organic
Manure Composting: The Effect of Membrane Cover**

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Sciences**

Gödöllő

2023

ABSTRACT OF THESIS

The use of membrane covers in organic manure composting shows potential in mitigating greenhouse gas emissions and reducing ammonia volatilization. This study evaluates the efficiency of membrane covers, ProfiCover® and a market leading expanded polytetrafluoroethylene (ePTFE) membrane cover in reducing ammonia and greenhouse gas emissions during the thermophilic phase of organic manure composting at an industrial-scale composting facility. Gas measurements were collected from inside and outside of covered and uncovered compost piles during thermophilic phase on 5th day of composting. Statistical analyses including Shapiro-Wilk normality test, Mann-Whitney U test, Levene's homogeneity test, independent sample t-tests and emission reduction percentages were utilized to compare emissions between covered and uncovered piles. Both the membrane covers significantly reduced ammonia and GHG emissions compared to the uncovered pile based on the median values and statistical tests. The ePTFE membrane cover significantly reduced gaseous emissions: 90.84% for Ammonia, 59.63% for Carbon Dioxide, 23.08% for Nitrous Oxide and 44.80% for Propane equivalent. In contrast, ProfiCover® achieved greater reductions: 93.25% for Ammonia, 85.92% for Carbon Dioxide, 55.63% for Methane, 56.67% for Nitrous Oxide, and 84.47% for Propane equivalent. A comparative analysis was also conducted to investigate the efficacy of emission reduction by the membrane covers inside the compost piles. The results of the comparative analysis highlighted the reduction of emissions inside the covered piles which resulted in reducing nitrogen losses and suggest better nitrogen retention in the compost with the use of the membrane covers. The results indicate that membrane covers can be an effective strategy to reduce ammonia and greenhouse gas emissions during industrial-scale organic manure composting. Further research is needed to optimize materials and integration with other emission control methods for a comprehensive solution.

Keywords: Composting, Membrane covers, GHG emissions, Ammonia, Organic Manure