

Analyse Methane Generation from Garden Waste at UiTM Shah Alam

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Structured Abstract

Background: Garden waste, such as grass clippings and dried leaves, has the potential to be converted into biogas through anaerobic digestion. However, compositional variability among garden waste types may affect methane yield and system efficiency. This study compares the biodegradability of two types of garden waste (dried leaves and grass clippings) and quantifies their methane generation.

Methods: Physicochemical characterization was performed on dried leaves and grass clippings collected from Universiti Teknologi MARA (UiTM) Shah Alam. A 46-day anaerobic digestion was conducted using a laboratory-scale reactor setup. Cumulative methane yields were recorded, and kinetic parameters were calculated using a first-order kinetic model to determine the methane generation rate constant (k) and the ultimate methane yield (L_0).

Results: The physicochemical characterization revealed that grass clippings had higher moisture content (41.78%) and lower ash content (12.54%) compared to dried leaves, which had lower moisture (9.65%) and higher ash (28.23%). Methane production analysis showed that grass clippings yielded a significantly higher cumulative methane volume of 30.80 L/kg VS, whereas dried leaves produced only 3.59 L/kg VS. The corresponding methane generation rate constants (k) were 0.0516 day^{-1} for grass clippings and 0.0146 day^{-1} for dried leaves. Additionally, the ultimate methane yield (L_0) was slightly higher for grass clippings (0.7106 L/kg VS) than for dried leaves (0.6945 L/kg VS).

Conclusion: Grass clippings demonstrated higher biodegradability and greater potential for methane yield than dried leaves, attributed to their fresher composition, higher moisture content, and better pH stability. These findings provide essential baseline data for future waste-to-energy initiatives and support the development of efficient organic waste management strategies on campus.

Keywords: Anaerobic digestion, methane yield, garden waste, kinetic modelling, biogas

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