

Sudarat Kucamau 2010: Use of Plant Comet Assay to Evaluate Toxicity of Landfill Gas and Volatile Organic Compounds at Sanitary Landfill and Open Dump in Rainy and Dry Season. Master of Engineering (Environmental Engineering), Major Field: Environmental Engineering, Department of Environmental Engineering. Thesis Advisor: Associate Professor Wilai Chiemchaisri, D.Tech.Sc. 179 pages.

The study aims to investigate the potential genetic damages of the gas emissions from solid waste disposal sites by applying the Plant Comet Assay approach and using the Pothos (*Epipremnum aureum*) as the sample. In order to find the correlations of the methane gas emissions and DNA damage in different settings and seasons, the experiments were conducted at an open-dump site and a landfill during dry and rainy seasons at Nonthaburi province. The results appeared that high emission rates of methane and carbon dioxide were found during dry season in open-dump site (31.8 ± 14.1 and $20.1 \pm 8.7 \text{ g/m}^2 \cdot \text{d}$, respectively), and low emission rates of those appeared during rainy season in landfill (1.3 ± 1.6 and $5.5 \pm 1.2 \text{ g/m}^2 \cdot \text{d}$, respectively). Their emissions from the open-dump site were higher than those from the landfill all seasons ($P < 0.05$). There were no difference in rates of each gas emission between dry and wet seasons ($P > 0.05$) in each disposal site. The emissions of volatile organic compounds (VOCs) during rain season in open-dump site ($84.3 \pm 13.3 \text{ mg/m}^2 \cdot \text{d}$) were not different from those in dry season ($83.9 \pm 15.1 \text{ mg/m}^2 \cdot \text{d}$) ($P > 0.05$), similarly those in rainy season in landfill site ($31.2 \pm 3.8 \text{ mg/m}^2 \cdot \text{d}$) were not different from those in dry season ($30.7 \pm 3.8 \text{ mg/m}^2 \cdot \text{d}$) ($P > 0.05$). However, VOCs emissions in open-dump were significantly higher than in landfill site ($P < 0.05$) and the highest concentration was benzene. The average of DNA damage of Pothos at 96 exposing hours in the open dump ($60.6 \pm 13.5\%$) was significantly higher than that in the landfill ($41.7 \pm 10.5\%$). Besides, they were higher than those in rainy season both in the open dump (42.9 ± 10.55) and in the landfill ($31.4 \pm 4.1\%$), ($P < 0.05$). The results suggest that DNA damage degrees of Pothos directly correlated to the biogas and volatile organic compound emission rates ($R^2 = 0.703-0.807$).

Student's signature

Thesis Advisor's signature