



Isolation, Screening, and Characterization of Methanogenic Bacteria for Biogas Production Potentials from Cow Dung and Plantain Peels

Uchenna Oyeagu^{1,2}, Obinna Ugwu¹, Victor Ekemezie^{1,3}, Adeniji Oluwatosin Abiye⁴ and Akinagbe Evelyn Sade⁴

¹Department of Microbiology, University of Nigeria, Nsukka, Enugu State

²South East Zonal Biotechnology Center, University of Nigeria, Nsukka, Enugu State

³Department of Biological Science, Godfrey Okoye University, Enugu State

⁴National Biotechnology Research and Development Agency, Abuja

Corresponding Author; Obinna Ugwu +2349039337507

ABSTRACT

With the growing demand for sustainable energy, biogas has emerged as a viable alternative to fossil fuels. This study explores the production of biogas using plantain peels. The samples (plantain peel and cow dung) were collected from ready to eat plantain vendors and an abattoir respectively. A 6 kg of the sample was mixed in the ratio 3:3 and was mixed with water to form slurry in the ratio 3:1 sample to water in a 32-liter fixed dome anaerobic. Physiochemical analysis was performed on the slurry. A 100 ml of the sample from the slurry was collected after 10 days of charging the digester to observe flaming. The sample was serially diluted and methanogen isolated anaerobically using sodium thioglycolate broth. The isolated bacteria were identified using morphological, biochemical characterization and molecular techniques. Quality of gas produced was assessed using Gas Chromatography – Flame Ionization Detector (GC-FID). Three (3) bacteria isolates, were isolated which are CPi, CPii, and CPiii. Isolates CPi and CPii were moderately positive in TSI test while CPiii was highly positive in TSI test. The substrate mixture had about 83.6 % moisture content. The GC-FID analysis showed Methane (69 %), Carbon (ii) oxide (26.91 %). The highest gas yield was recorded on the 21st day when the slurry temperature reached 40°C, the ambient temperature was 31°C, and the pH was 6.4. This study highlights the effectiveness of co-digesting cow dung and plantain peels in enhancing biogas production through activities of methanogenic bacteria. Beyond energy generation, this approach offers a practical solution for waste management by converting organic waste into a valuable resource.

Keywords: Anaerobic digestion, cow dung, plantain peels, bio digester, methanogens.