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Investigation of biogas generation from the waste of a vegetable and cattle market of Bangladesh

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The results of this study on the type and quantity of solid waste generated in a rural vegetable and cattle market, and biogas generation from the waste are presented in this paper. The market waste was collected; individual items were separated and measured on both normal days and haat days. During a normal day, it was found that very insignificant amount of waste was generated. But on a haat day, a large amount of waste was found to be generated. On an average, the amount of easily biodegradable waste was 589 kg out of the total waste of 1004 kg on a haat day. Cow dung, fish, ginger, cursed lobe, guava and banana leaves were the major biodegradable wastes. Other biodegradable wastes were goat dropping, bitter melon, pointed gourd, dhundul and brinjal. The total solids (TS) and volatile solids (VS) of the biodegradable portion of the market waste were determined and were found to be 17.94% and 13.87% respectively. Laboratory experiments were run order to generate biogas in anaerobic digesters using the same composition of the market waste. They were placed in a large closed chamber and room heaters were used to maintain the temperature of the chamber at a constant value. One set of batch experiments and another set of daily feed experiments were carried out. In the first set of experiments, 500 g and 750 g waste added in 2 digesters separately and inoculum was added to make the effective volume of 2.1 L for each digester. The experiments were operated for 46 days and the average temperature was found to be 34.7°C. In the second set of experiments, one digester was initially fed with 750 g waste having the effective volume of 2.2 L. Another two-chambers (connected in series) digester was initially fed with 750 g waste having the effective volume of 3 L. Then the daily feed was 18.75 g waste mixed with 20 mL of water with dispensing 40 mL slurry from the digester. The experiments were run for 40 days and the average temperature was 35.1°C. The results of the 1st set of experiments revealed that the daily biogas generation rates were 0.22 and 0.48 m3/m3 of digester volume for the concentrations of waste as 0.238 and 0.357 kg/L respectively for 40 days retention time, and the respective rates of biogas producton were 0.30 and 0.40 m^3/kg of VS added. The results of the 2nd set of experments revealed that the daily production of biogas was 0.44 and 0.37 m^3/m^3 of the digester volume for the one-chamber digester and two-chamber digester respectively. But in terms of per kg VS added, the average daily gas generation rates were 0.185 m^3 and 0.212 m3 for the respective digesters.

Biography

Md. Abdul Jalil is a Professor of Civil Engineering Department at Bangladesh University of Engineering & Technology (BUET), Dhaka, Bangladesh. He received his BSc in Civil Engineering in 1986 from BUET. He obtained his MSc in Civil Engineering in 1988 from the same university. He received his PhD in Civil Engineering in 1993 from Tokyo University, Japan under ADB Scholarship. He conducted Post-doctoral research on Water Management in Loughborough University, UK under Commonwealth Fellowship. He was appointed as a Lecturer in the Department of Civil Engineering of BUET in 1986. He was promoted to the post of Assistant Professor in 1989. He became Associate Professor in 1996 and Professor in 2001. He has published over 36 papers upto now. His current research areas are biogas generation from solid wastes, water and wastewater treatment technologies, and rain water harvesing. He also works as a Consultant and completed over 45 important national development projects.

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