

ABSTRACT

Optimization of biogas production from a given substrate and digester is an issue that needs to be addressed during the development of anaerobic digestion. To maximize the biogas production rate, the operating parameters that influence anaerobic digestion must be controlled and monitored. This research was carried out using a 0.15 m³ laboratory digester. The study evaluated the effect of cow dung and maize silage mix ratios (1:1, 1:3, and 3:1) on biogas production which were compared to their pure substrates at a constant temperature of 20°C. The temperatures (20°C, 25°C, and 30°C) were then evaluated using the optimal mix ratio of 3:1 as feedstock. The Temperature of the digester was controlled and monitored using Programmable Temperature Controller (Multispan UTC 421) and the (PLC) running on SIEMENS LOGO. The mix ratios and temperatures showed a significant effect on biogas production ($P \leq 0.05$) with mix ratios of 3:1 and 1:1 improving biogas production by 31.24% and 15.52% respectively compared to cow dung. The temperatures of 25°C and 30°C increased biogas by 26.99% and 47.35% and methane increased by 3.92% and 11.76% respectively compared to the mesophilic temperature of 20°C. The study thus, recommends a mix ratio of 3:1 and the optimal temperature of 30°C for a 0.15 m³ laboratory temperature-controlled fixed-dome anaerobic digester of cow dung and maize silage as a substrate when fed as a batch reactor