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Impact of one month old sludge as top inoculum layer on biogas flow rate in dry batch type digesters

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The dry batch digesters established at Dickovita biogas plant in Wattala, Sri Lanka, treat pre-sorted Municipal Solid Waste (MSW) anaerobically to recover both energy and material in an environmentally friendly manner. Efficient biogas production has been achieved by the plant by adding three cow dung (inoculum) layers. Since a continuous supply of cow dung is not available, switching to an alternative inoculum source is a priority requirement for the continuation of the process. Hence, a laboratory scale study was planned to determine the impact of replacing the top cow dung layer by previously produced one month old sludge by the plant, on biogas flow rate. Dry batch type digesters designate treatment 1, 2 and control were set up using empty 20 L bottles, each consisting of 3 replicates. The experimental setup was comparable to the field operations conducted at the Dickovita biogas plant. The contents in each digester from bottom to top were bottom inoculum layer, first organic waste layer, middle inoculum layer, second organic waste layer and top inoculum layer respectively and the volume of water in each digester was 50% of the volume of the digester. The top inoculum layer of treatment 1, 2 and control consisted of cow dung, previously produced one month old sludge and organic waste respectively. Daily biogas flow rate, sludge temperature, sludge pH and internal and external air temperatures were recorded. The significant highest and lowest bio gas flow rates were recorded from treatment-2 and control respectively on day 04. One way ANOVA followed by Tukeys pair wise comparison tests confirmed that there were no significant differences ($P \geq 0.05$) between the mean biogas flow rates generated from treatment-1 and treatment-2. The mean internal air temperature and the mean internal sludge temperature of digesters varied between 28.2 °C – 33.9 °C and 27.1 °C – 31.2 °C respectively. Hence, the digesters showed a mesophilic type digestion. The study recommends that the previously produced one month old sludge by the plant could be used as the top inoculum layer to produce biogas without having an adverse impact on biogas flow rate, under mesophilic conditions.
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