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EVALUATION OF DIFFERENT SUBSTRATES FOR HYDROLYSIS AND SUBSEQUENT METHANOGENESIS IN THE ANAEROBIC REACTOR

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Anaerobic digestion is essentially a procedure that turns organic substrates into biogas, which serves as a renewable energy source. In this digestion process, different substrates are utilised for degradation. Biogas production is governed by four digestion stages of substrates: hydrolysis, acidogenesis, acetogenesis, and methanogenesis. Biogas production is prominent at the latter stage of the digestion process of the substrate in the anaerobic reactor. The time taken to initial degradation (hydrolysis, acidogenesis, acetogenesis) of the substrate can vary from a few days to several weeks. However, the effect of the substrate to move forward from the lag phase (hydrolysis, acidogenesis, acetogenesis) to the log phase (methanogenesis) has limited understanding. Therefore, the present study was carried out to determine the effect of substrate composition on subsequent methanogenesis in the anaerobic reactor. Cow dung was used as the base substrate. The base substrate was co-digested with four different substrate types: *Gliricidia*, kitchen waste, banana peels fermented in sugar, and a mixture of the above three substrates in 650 ml reactors. As a control, one reactor was kept only with cow dung. The reactor with a mixture of all substrate types exhibited a pH drop from 8 to 4 in 3 days, which witnessed accelerated hydrolysis (acid fermentation) and decomposition, while the other substrate combinations took more than 6 days to drop the pH from 8 to 4. Moreover, it was found that the reactor with the mixture of substrates showed the highest gas volume and flame time. Cow dung, kitchen waste, *Gliricidia*, and Banana peels fermented in a sugar substrate mixture can be identified as a substrate combination that effectively performs hydrolysis and subsequent methanogenesis. It can be concluded that the selection of substrate combinations for co-digestion significantly impacts biogas production to reduce the lag phase and increase the efficiency of the log phase.

Keywords: Anaerobic digestion, Biogas, Co-digestion, Cow dung