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Biogas Production from Zebra Manure and Winery Waste Co-Digestion

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Abstract : Currently, the rising energy demand as a result of an increase in the world's population and the sustainable use of abundant natural resources are key issues facing many developed and developing countries including South Africa. Most of the energy to meet this growing demand comes from fossil fuel. Use of fossil fuels has led to environmental problems such air pollution, climate change, and acid rain. In addition, fossil fuels are facing continual depletion, which has led to the rise in oil prices, leading to the global economies melt down. Hence development of alternative clean and renewable energy source is a global priority. Renewable biomass from forest products, agricultural crops, and residues, as well as animal and municipal waste are promising alternatives. South Africa is one of the leading wine producers in the world; leading to a lot of winery waste (ww) being produced which can be used in anaerobic digestion (AD) to produce biogas. Biogas was produced from batch anaerobic digestion of zebra manure (zm) and batch anaerobic co-digestion of winery waste (ww) and zebra manure through water displacement. The batch digester with slurry of winery waste and zebra manure in the weight ratio of 1:2 was operated in a 1L container at 37°C for 30days. Co-digestion of winery waste and zebra manure produced higher amount of biogas as compared to zebra manure alone and winery waste alone. No biogas was produced by batch anaerobic digestion of winery waste alone. Chemical analysis of C/N ratio and total solids (TS) of zebra manure was 21.89 and 25.2 respectively. These values of C/N ratio and TS were quite high compared to values of other studied manures. Zebra manure also revealed unusually high concentration of Fe reaching 3600pm compared to other studies of manure. PCR with communal DNA of the digestate gave a positive hit for the presence of archaea species using standard archea primers; suggesting the presence of methanogens. Methanogens are key microbes in the production of biogas. Therefore, this study demonstrated the potential of zebra manure as an inoculum in the production of biogas.

Keywords : anaerobic digestion, biogas, co-digestion, methanogens
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