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EFFECT OF THE NUTRITIONAL COMPOSITION OF FRUIT WASTES ON METHANE GAS PRODUCTION AND ENERGY POTENTIAL

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Abstract

Nutrients have been considered the main factor affecting microorganisms responsible for methane gas production during anaerobic digestion processes. In this study, the nutritional composition of some fruit wastes; mango (M), watermelon (W), pawpaw (P), their effects on methane gas production, and resulting energy values were assessed. Substrate samples for anaerobic digestion where prepared into various slurry treatments; M, W, P, WM, PW, MP, MWP and CONTROL. Proximate compositions of the substrates were determined using standard methods of the Association of Official Analytical Chemists, while the mineral element composition were assayed using Perkin Elmer atomic absorption spectrophotometer (Model 306). Qualification of methane gas yields were by Exibd I Portable Multi-Gas Analyzer (Model 160204001). The energy values of the methane gas were determined using standard equations. The nutritional analysis revealed that the substrates had high amounts of nutritive contents suitable for methane gas production, however, pawpaw substrate contained a higher level of cellulose compared to the other two fruit wastes. At the end of the process the total methane gas yields from the different fruit waste treatments and the positive CONTROL (Cow dung) treatment were respectively 86.8cm^3, 232.8 cm^3, 0.0 cm^3, 309.4 cm^3, 103.2 cm^3, 56.2 cm^3, 263.2 cm^3 and 252.2 cm^3 from M, W, P, WM, PW, MP, MWP and CONTROL, each having energy value estimations of 62600 kJ/m^3, 209600 kJ/m^3, 0 kJ/m^3, 274400 kJ/m^3, 211200 kJ/m^3, 69400 kJ/m^3, 284400 kJ/m^3, and 97200 kJ/m^3. The energy potential of the methane gas produced from Watermelon treatment and other treatments made especially with watermelon waste were appreciably higher, if harnessed, can contribute immensely to the development of renewable energy in Nigeria.

Keywords: anaerobic digestion; energy values; fruit wastes; methane gas; renewable energy

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