INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

Food waste (FW) as a highly decomposable feedstock can be utilized for the production of methane gas. Animal dung is one of the best sources of inoculum for anaerobic digestion (AD) because of its digestive system. Animal dung has less biodegradable and more microbial consortia which can be well utilized for the purpose of inoculum in AD of FW. The present study focuses on animal dungs as inoculum in different ratios to approach in novel way to enhance AD process and more methane production. In present study, mixture of FW from the Indian Institute of Technology Guwahati (IITG) hostels were used as substrate and digester sludge (DS), different livestock dungs such as poultry dung (PD), goat dung (GD), cow dung (CD), piggery dung (PGD) and rhinoceros dung (RD) were used as inoculum. The results indicated that cow dung and piggery dung inoculum was more suitable for the anaerobic digestion of FW as compared to other dungs. To overcome the lag in hydrolysis phase in anaerobic digestion, the effects of various pretreatments such as hot air oven, microwave, autoclave, alkali and electrohydrolysis on FW was studied. In the batch reactor study, four batch reactors with hot air oven pretreated, alkali pretreated, electrohydrolysis pretreated and untreated FW were studied for 40 days. The results revealed that for hot air oven pretreatment, the highest solubilisation of 1.4 times with respect to untreated FW was obtained at a temperature of 75°C and time of exposure of 90 min with the soluble chemical oxygen demand (COD) increasing from 740 g/kg of dry FW for control to 1027 g/kg of dry FW. In present research, the work was focused on reactor design for more methane production in less hydraulic retention time (HRT) with high organic loading rate (OLR) in a reactor which eradicates the problems stated by the researchers on single and two stage reactor systems. Anaerobic bi-phased baffled reactor (ABBR) has been designed for the treatment of organic solid waste and to recover more biogas. Highest methane production was achieved with two different inocula (CD and DS) in lowest HRT in Laboratory scale ABBR. The HRT was varied from 8 to 14 days in both studies in that each HRT was maintained for 30 days. Results proved that the soluble COD decreased in higher percentage in cow dung as inoculum study and the gas production also attained 0.528 L/g VS/d in HRT 10 days compared to digested sludge reactor. Pilot scale ABBR performed well at the environmental temperature varies from 22 to 34°C. The COD reduction was less at the startup period, later it was increased to an average of 68-72% at HRT 10 days during first 30 days of the reactor.