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An optimization of municipal solid waste flows: Environmentally sustainable strategies for municipalities

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Abstract

In nature, cellulose, lignocellulose and lignin are major sources of plant biomass; their recycling is indispensable for global carbon cycle. The major portion of the municipal solid waste consists of lignocellulose. The incineration of organic fraction of municipal solid waste (OFMSW) with high moisture content and low calorific value is not environmentally, techno – commercially viable option for energy recovery. Optimization of biomethanisation process is aim to maximize organic waste stabilization at short digestion period with higher energy recovery. The biomethanisation studies, demonstrate co-digestion of substrates improves CH_4 yield due to nutrients balance. Fungi are low sensitive to environment, thrive in acidic environment and produces required multi-enzyme, attach to cell envelope and hydrolyze the substrate for energy recovery. Fermentation of cellulose by the monoculture results in the formation of H_2, CO_2, formate, acetate, lactate, succinate, and ethanol. In co-cultures with Methanobacterium, H_2 and formate reduction indicates it's utilized in CH_4 production. Engineered co-culture of microorganisms is essential for the heterogeneous complex organic substrate degradation for extraction of unutilized energy fraction of biomass, as potential source of energy.

***Key words**:* MSW, anaerobic fungi, cellulose, degradation, enzymes