*Environmental Engineering and Management Journal* December 2019, Vol. 18, No. 12, 2673-2682
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

*"Gheorghe Asachi" Technical University of Iasi, Romania*


# ENHANCEMENT OF BIOGAS PRODUCTION FROM FOOD WASTES IN A HYBRID ANAEROBIC–AEROBIC BIOREACTOR BY MANURE ADDITION AND LIME-PRETREATMENT OF RECYCLED LEACHATE

**Fatemeh Aliasgari[1], Hatam Godini[1,2]*, Mohammad Noorisepehr[1,2], Navid Tafreshi[3]**

[1]*Environmental Health Engineering Department, School of Health, Alborz University of Medical Sciences, Karaj, Iran*
[2]*Research Center for Health, Safety and Environment (RCHSE), Alborz University of Medical Sciences, Karaj, Iran*
[3]*Department of chemistry, Tehran north branch, Islamic Azad University, Tehran, Iran*

## Abstract

The production of food wastes is a serious issue in developed and developing countries. The biogas production technology is one of the most sustainable methods for treating food wastes. Currently, there is a great need to implement suitable methods to enhance biodegradation and methane production. This study investigated the effect of manure addition and leachate lime-pretreatment on the biogas and methane production from spoilable municipal solid wastes using a hybrid anaerobic-aerobic bioreactor as a new method.

Three laboratory-scale columns were constructed to simulate a hybrid anaerobic-aerobic bioreactor without manure addition and leachate pretreatment as control (R1), two hybrid bioreactors with manure addition and without recycled leachate pretreatment (R2), and manure addition and lime pretreatment of recycled leachate (R3). All simulated bioreactors operated as continuous for about 8 months. Biogas and $CH_4$ production were measured to evaluate the biodegradability of food wastes and efficacy of bioreactors.

The results indicated consistently more biogas production under manure addition and leachate pretreatment (R3). The accumulative methane yield was determined to be 17.46, 53.79, and 283.41 mL/gVS for R1, R2, and R3 bioreactors, respectively, after 8 month of operation. The cumulative methane yield in the R3 bioreactor was 16.23 and 5.27 times higher than in R1 and R2 bioreactors, respectively. Therefore, the food waste biodegradation in R3 was greater than in R1 and R2. These results showed that the manure addition and leachate lime-pretreatment were effective in increasing the biogas and methane production of food wastes.

*Key words:* biogas, food waste, hybrid anaerobic-aerobic bioreactor, leachate, methane

*Received: December, 2018; Revised final: May, 2019; Accepted: June, 2019; Published in final edited form: December, 2019*

* Author to whom all correspondence should be addressed: e-mail: Godini_h@yahoo.com; Phone: +98 2634219689; Fax: +98 2634219689