Biological disintegration of microalgae for biomethane recovery-prediction of biodegradability and computation of energy balance

S. Kavitha, R. Yukesh kannah, J. Rajesh Banu, S. Kaliappan, M. Johnson

PII: S0960-8524(17)30646-6
DOI: http://dx.doi.org/10.1016/j.biortech.2017.05.007
Reference: BITE 18033

To appear in: *Bioresource Technology*

Received Date: 22 March 2017
Revised Date: 27 April 2017
Accepted Date: 1 May 2017

Please cite this article as: Kavitha, S., Yukesh kannah, R., Rajesh Banu, J., Kaliappan, S., Johnson, M., Biological disintegration of microalgae for biomethane recovery-prediction of biodegradability and computation of energy balance, *Bioresource Technology* (2017), doi: http://dx.doi.org/10.1016/j.biortech.2017.05.007

Biological disintegration of microalgae for biomethane recovery-prediction of biodegradability and computation of energy balance

S. Kavitha[a1], R. Yukesh kannah[a2] J. Rajesh Banu[a3]*, S. Kaliappan[b], M. Johnson[c]

[a1,a2,a3*] *Department of Civil Engineering, Regional campus, Anna University, Tirunelveli, India*

[b] *Department of Civil Engineering, Ponjesly College of Engineering, Nagercoil, India*

[c] *Centre for Plant Biotechnology, St Xavier's College, Palayamkottai, Tirunelveli, India*

Abstract

The present study investigates the synergistic effect of combined bacterial disintegration on mixed microalgal biomass for energy efficient biomethane generation. The rate of microalgal biomass lysis, enhanced biodegradability, and methane generation were used as indices to assess efficiency of the disintegration. A maximal dissolvable organics release and algal biomass lysis rate of about 1100, 950 and 800 mg/L and 26, 23 and 18% was achieved in PA+C (protease, amylase + cellulase secreting bacteria), C (cellulase alone) and PA (Protease, amylase) microalgal disintegration. During anaerobic fermentation, a greater production of volatile fatty acids (1000 mg/L) was noted in PA+ C bacterial disintegration of microalgal biomass. PA+C bacterial disintegration improve the amenability of microalgal biomass to biomethanation process with higher biodegradability of about 0.27 gCOD/g COD, respectively. The energy balance analysis of this combined bacterial disintegration of microalgal biomass provides surplus positive net energy (1.14 GJ/d) by compensating the input energy requirements.

Keywords

Microalgal biomass; bacterial disintegration; prediction of biodegradability; biomethanation; energy balance analysis

a* Corresponding author: Dr. J. Rajesh Banu, Department of Civil Engineering, Regional Centre of Anna University, Tirunelveli - 627007, India. Tel: 9444215544, Email id: rajeshces@gmail.com