

Analysis of a Lignocellulose Degrading Microbial Consortium to Enhance the Anaerobic Digestion of Rice Straws

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Abstract : Rice straw is lignocellulosic biomass which can be utilized as substrate for the biogas production. However, due to the property and composition of rice straw, it is difficult to be degraded by hydrolysis enzymes. One of the pretreatment method that modifies such properties of lignocellulosic biomass is the application of lignocellulose-degrading microbial consortia. The aim of this study is to investigate the effect of microbial consortia to enhance biogas production. To select the high efficient consortium, cellulase enzymes were extracted and their activities were analyzed. The results suggested that microbial consortium culture obtained from cattle manure is the best candidate compared to decomposed wood and horse manure. A microbial consortium isolated from cattle manure was then mixed with anaerobic sludge and used as inoculum for biogas production. The optimal conditions for biogas production were investigated using response surface methodology (RSM). The tested parameters were the ratio of amount of microbial consortium isolated and amount of anaerobic sludge (MI:AS), substrate to inoculum ratio (S:I) and temperature. Here, the value of the regression coefficient $R^2 = 0.7661$ could be explained by the model which is high to advocate the significance of the model. The highest cumulative biogas yield was 104.6 ml/g-rice straw at optimum ratio of MI:AS, ratio of S:I, and temperature of 2.5:1, 15:1 and 44°C respectively.

Keywords : lignocellulolytic biomass, microbial consortium, cellulase, biogas, Response Surface Methodology (RSM)

Conference Title : ICBAE 2015 : International Conference on Biotechnology and Agricultural Engineering

Conference Location : Tokyo, Japan

Conference Dates : May 28-29, 2015