Abstract ID: P59

COMPARISON OF BIODEGRADABILITY AND SEQUENTIAL FERMENTABILITY OF FACTORY REFUSE TEA, PALMYRA HUSK AND GRASS CLIPPINGS

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Abstract

Lignocelluloses are the most abundant sustainable source to produce biofuels and other biochemical products, some of which are solely prepared from lignocelluloses and have no fossil-based equivalent. The major bottleneck here is the effective degradation of lignocellulose due to its recalcitrance. The present study aimed at comparing the biodegradation of three lignocellulosic wastes (factory refuse tea, palmyra husk, and grass clippings) by microbial consortia from cow dung, compost and coir retting water and the extent of sequential ethanol fermentation. The ground, 2 mm sieved, oven dried and NaOH pretreated lignocellulosic substrates were incubated with the respective thrice enriched microbial consortia in 100 ml of basal medium (5g of peptone powder & 3g of yeast extract per litre of distilled water) at room temperature in static conditions in a completely randomized design with eight replicates. In the first enrichment, 1 ml of the microbial source was incubated for 5 days in 100 ml of the basal medium with the same pretreated substrate. Second and third enrichments were done by inoculating 1 ml of the first and second enrichments respectively into 100 ml of fresh medium. Four replicates were analyzed for biodegradation on the 5th day and the rest of the replicates was inocubated with 1g of *S.cerevisiae* for 3 days and the ethanol content was determined using the solvent extraction, dichromate oxidation and absorbance at 595 nm. One-way ANOVA followed by Tukey's test ($p < 0.05$) revealed that both degradation and ethanol yield differed significantly among substrates and microbial consortia. Palmyra by compost consortium showed the lowest biodegradation (19.46%) and the highest (80.95%) in grass clippings by cow dung consortium. The ethanol yield ranged from 1.0048 – 1.4679 g/g but did not correlate with lignocellulose degradation ($r = 0.0378$ and $P = 0.923$). Further studies with sugar content of hydrolysates and the precise ethanol content are necessary for arriving at conclusions.

Keywords: *biodegradation, bioethanol, enriched microbial consortia, fermentation, lignocellulose substrates*