

Optimization and Enhancement of Volatile Fatty Acids Biosynthesis via Anaerobic Mesophilic Digestion of Biomass Waste Mixtures

تحسين وتعزيز التخليق الحيوي للأحماض الدهنية المتطايرة عن طريق الهضم اللاهوائي المتوسط لمخاليط
نفايات الكتلة الحيوية

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Abstract

Anaerobic mesophilic batch digestion of lime-pretreated rice straw/chicken manure/ rumen fiber mix was investigated to determine their feasibility as a feedstock to produce volatile fatty acids (VFAs). The influence of solid content (10, 15 & 20%) on the bioreactor performance was studied in batch system. The increase in solid content gave a slight increase in VFAs concentration but higher productivity of 12.1 gL⁻¹d⁻¹. Response surface methodology (RSM) was utilized to optimize the process responses (acid concentration and productivity) using central composite design (face centered) with three coded levels and independent process variables (solid content, and time). Based on the significant predicted mathematical models, the optimum operating parameters for volatile fatty acids production were identified to maximize the acid concentration and the productivity. The optimum values were 20% for solid content at 24 h contact time. The acid concentration and productivity values achieved at this condition were 11.64 g/L and 10.87 gL⁻¹d⁻¹, respectively. So, the two developed mathematical models for both acid concentration and productivity responses have been confirmed the experimental results and can be used to navigate the design space.