

Agrowastes of banana peels as an eco-friendly feedstock for The production of biofuels using immobilized yeast cells

ABSTRACT

Liquid biofuels such as bioethanol is a promising renewable fuel as it can be produced from various biomass wastes as feedstocks. The concept of waste to wealth approach is inevitable for bioethanol production. In Malaysia, banana peels are one of the largest agricultural wastes found in the local market. Thus, in this study, banana peels were used as a feedstock to produce bioethanol through fermentation using immobilized yeast cells. For higher yield of bioethanol, optimization parameters were conducted for both dilute acid hydrolysis and fermentation process. First, the banana peels were sliced and oven-dried at 70°C for 24 h before being ground to fine powder. Then, the samples were subjected to dilute acid hydrolysis. Parameters such as concentration of H₂SO₄, temperature and time were optimized during the hydrolysis. Higher amount of reducing sugar was obtained at 0.10 M H₂SO₄, at 90°C for 20 min with 5.190 mg/mL, 5.196 mg/mL and 5.306 mg/mL respectively for the hydrolysis process. Yeast *Saccharomyces cerevisiae* was immobilized using 3% (w/v) of sodium alginate and 2% (w/v) calcium chloride using entrapment technique, in the form of beads. These immobilized beads were added into the fermentation medium together with the optimized pretreated hydrolysate of banana peels. Parameters such as cells loading (weight of beads), pH, temperature and time were also optimized in the fermentation process. From the results, it was found out that the optimized parameters of 9g of cells loading, pH 5, at 30°C for 24 h utilized more sugar during fermentation process based on the absorbance reading.