

ABSTRACT

Bioethanol fermentation from non-edible lignocellulosic waste material, such as corn cobs, using immobilised yeast cells will greatly reduce waste, environmental pollution and the world's reliance on crude oil and natural gas. Previous studies have shown that immobilised yeast cells are efficient biocatalysts for repeated batch fermentations and the continuous fermentation of beer and wine. Studies have also shown that immobilisation increased fermentation rates. Corn cob is an attractive feedstock and support for immobilisation because it is cheaply available and in abundance throughout the world. The Ammonia treatment process produced 47.7 % more sugars than the Concentrated Sulphuric Acid treatment process and was therefore used in free and immobilised yeast cell fermentation systems using alcohol tolerant yeast strains, *Saccharomyces cerevisiae* and *Pichia stipitis*. Immobilisations on solid delignified and untreated corn cob supports were carried out. Adsorption of yeast cells on delignified corn cob, suspended for 24 hours, in Yeast Extract Peptone Dextrose (YPD) media resulted in the best immobilisation since it adsorbed approximately 11.9×10^{10} yeast cells and was used in subsequent batch fermentations. The concentration of bioethanol produced from immobilised cell fermentation was 20 % higher than that produced from free cell fermentation. One ton of corn cob would produce 68.4 L of ethanol using this method after purification. Immobilised biocatalysts used in this study are efficient in the fermentation of bioethanol from corn cob and are worthy of further research in repeated batch and continuous fermentation processes.