ABSTRACT

The production of cellulosic ethanol from lignocellulosic biomass has the potential to lead the bioindustrial revolution necessary to the transition from a fossil fuel-based economy to a sustainable carbohydrate economy. Lignocellulosic materials are available as a by-product of many industrial processes and agricultural materials, or can potentially be produced from dedicated energy crops. Effective release of fermentable sugars through biomass pretreatment followed by enzymatic hydrolysis is among the most costly steps for emerging cellulosic ethanol biorefineries. In this study already pretreated bagasse was used to hydrolyze by cellulose enzyme. This study provided an in-depth understanding of biomass saccharification for the production of cellulosic ethanol for cellulose hydrolysis. Cellulose is a six-carbon polysaccharide found in most plant life and is one of the most abundant organic compounds on the planet. While the first generation of ethanol facilities uses sugar and starch based (corn kernels) plants as their feedstock, the next generation will use cellulosic sources such as bagasse, wood chips, switchgrass, and forest residues. The enzymatic hydrolysis of treated bagasse was carried out with commercial cellulase enzyme of Genencor OPTIFLOW^{TM} RC 2.0. This enzyme was complex which digests plant cell walls which are composed of cellulose, hemicellulose and B-glucan.In present work. The parameters which effect on the enzyme activity were optimized during the saccharification 2% KOH treated bagasse for the release of sugars for further used in fermentation.The maximum 75% scarification was achieved at 60 ^{o}C ,pH 5.0, rpm 150 and for 48 hours. The hydrolyzates containing the total sugars (55mg/ml), reducing sugars (40mg/ml) and glucose (20mg/ml) were further used to ferment into ethanol by *Saccharomyces cerevisiae* G-4. The *Saccharomyces cerevisiae*G-4 was used for alcoholic fermentation using bagasse hydrolyzate. The fermentation was optimized with respect to temperature, pH and inoculum size. Results revealed a temperature of 32.5 ^{o}C, pH 5.0, and 2.5% inoculum size for 48 hours optimum for fermentation. After optimizing these parameters, the experiment was scaled to fermenter level. Immobilization of yeast cells was carried out by entrapment in 2% calcium alginate and tested for ethanol production. Under optimized conditions, *S. cerevisiae* produced 9.56% of ethanol. Immobilization resulted in 8.56%ethanol after 48 hours and the same yeast cells were reused to carry out fermentation. The reuse of immobilized cells gave 5.16% ethanol yield.