ABSTRACT

Bioconversion of pre-treated halophyte *Atriplex crassifolia* into saccharides was carried out using thermophilic cellulases. The halophyte *Atriplex crassifolia* was subjected to acid, alkali and microwave pre-treatments. The pre-treated substrates were subjected to compositional analysis. Maximum delignification i.e. 56.6% and maximum cellulosic content i.e. 57.7% was shown by the substrate pre-treated with 3% concentration of hydrochloric acid. The results were further validated by subjecting the halophytes pre-treated using different methods to enzymatic saccharification with thermophilic cellulases. The highest saccharification yield i.e. 39.5% was noted for the halophyte pre-treated using 3% hydrochloric acid. One variable at a time experimental design was opted for the optimization of saccharification parameters. Two different methods were opted for the addition of cellulases to conduct enzymatic hydrolysis i.e. sequential addition of cellulases and simultaneous addition of cellulases. Simultaneous addition of cellulases resulted in better enzymatic hydrolysis i.e. 42.4% compared to hydrolysis via sequential addition of cellulases i.e. 39.1%, respectively. Different parameters analyzed for optimization of saccharification included incubation time (1 - 8 h), incubation temperatures (70 - 90°C), substrate concentration (0.20 - 0.50g), Endo-1,4-β-glucanase concentration (50 - 400 U), Exo-1,4-β-glucanase concentration (200 - 500 U) and β-1,4-glucosidase concentration (800 - 1100 U). Cellulases concentration of Endo-1,4-β-glucanase (300 U), Exo-1,4-β-glucanase (400 U) and β-1,4-glucosidase (1000 U) were optimized for 0.40g of pre-treated halophyte *Atriplex crassifolia*, yielding 52.7% saccharification when simultaneously added and incubated for 6 h at 75°C. The reducing sugar slurry obtained after optimization of saccharification was used in place of glucose in submerged fermentation for bioethanol production. The fermentation medium was inoculated with *Saccharomyces cerevisiae,* incubated at 30°C and 180 rpm for 96 hours. Ethanol production was estimated using potassium dichromate method. Maximum percentage of bioethanol production i.e. 16.33% was observed at 72 h.