Thermochemical and Biological Pretreatment Study for Efficient Sugar Release from Lignocellulosic Biomass (Deodar and Sal Wood Residues)

Authors : Neelu Raina, Parvez Singh Slathia, Deepali Bhagat, Preeti Sharma

Abstract : Pretreatment of lignocellulosic biomass for generating suitable substrates (starch/ sugars) for conversion to bioethanol is the most crucial step. In present study waste from furniture industry i.e sawdust from softwood Cedrus deodara (deodar) and hardwood Shorea robusta (sal) was used as lignocellulosic biomass. Thermochemical pretreatment was given by autoclaving at 121°C temperature and 15 psi pressure. Acids (H_2SO_4, HCl, HNO_3, H_3PO_4), alkali ($NaOH$, NH_4OH, KOH, $Ca(OH)_2$) and organic acids ($C_6H_8O_7$, $C_2H_2O_4$, $C_4H_4O_4$) were used at 0.1%, 0.5% and 1% concentration without giving any residence time. 1% HCl gave maximum sugar yield of 3.6587g/L in deodar and 6.1539 g/L in sal. For biological pretreatment a fungi isolated from decaying wood was used , sawdust from deodar tree species was used as a lignocellulosic substrate and before thermochemical pretreatment sawdust was treated with fungal culture at 37°C under submerged conditions with a residence time of one week followed by a thermochemical pretreatment methodology. Higher sugar yields were obtained with sal tree species followed by deodar tree species, i.e., 6.0334g/L in deodar and 8.3605g/L in sal was obtained by a combined biological and thermochemical pretreatment. Use of acids along with biological pretreatment is a favourable factor for breaking the lignin seal and thus increasing the sugar yield. Sugar estimation was done using Dinitrosalicyclic assay method. Result validation is being done by statistical analysis.
Keywords : lignocellulosic biomass, bioethanol, pretreatment, sawdust

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