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Thermophilic enzymatic depolymerization of agricultural waste (wheat straw) into fermentable saccharides

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Statement of Problem: Bioethanol is a safe and renewable energy source; recently in spotlight since can be obtained utilizing agricultural waste products. Keeping in view this latest advancement, experiment was designed to optimize conditions for bioconversion of wheat straw into fermentable saccharides. These sugars can be used for biosynthesis of ethanol.

Methodology: Hydrolysis of variably i.e., acid and alkali pre-treated wheat straw was carried out by simultaneous and sequential addition of thermophilic cellulolytic enzymes along with optimization of different associated factors. A temperature of 55°C with the use of citrate phosphate buffer (pH 7.0) yielded maximum saccharides after 8 hours.

Findings: The optimal sequential addition of cellulases was observed using 150 U/mg of each enzyme i.e., Endo-1,4-β-glucanase, Exo-1,4-β-glucanase and β-1,4-Glucosidase. Thin layer chromatography confirmed the release of different reducing sugars including glucose, galactose and arabinose during saccharification.

Conclusion & Significance: Sequential action of cellulases on alkali pretreated wheat straw promisingly released appreciable amount of fermentable saccharides by allowing each enzyme to act completely before the addition of the next one, in order to reduce the problem of loss of enzyme and substrate reactivity with time. This process can be proved beneficial in developing renewable fuel at commercial level.

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