INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title	:	Saccharification and fermentation of Finger millet straw using recombinant hydrolytic enzymes and fermentative microbe for bioethanol production.
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SHORT ABSTRACT

Three lignocellulosic biomasses, Sorghum, Finger millet and Pearl millet straw were screened for their potential as a feedstock for bioethanol production. Finger millet straw (FMS) containing the highest holocellulose (69 wt%), cellulose (36 wt%) and hemicellulose (33.5 wt%) contents among the three candidates was selected as the best feedstock. ADL (5 wt%) contents were similar in all the three feedstocks. Among 12 pretreatment methods, 1% (w/v) NaOH combined with oven heating was the best pretreatment method on FMS, as it provided better accessibility to the endo-1,4-β-xylanase (*Ct*Xyn11A) and endo-1,4-β-glucanase (*Ct*Cel8A). Hemicellulose saccharification from the pretreated (1% (w/v) NaOH + Oven heating) FMS by recombinant endo-1,4-β-xylanase (*Ct*Xyn11A) and exo-1,4-β-xylosidase (*Bo*GH43A) by using Box-Behnken design resulted in 24.7% of xylan to xylose conversion. The acid hydrolysate from the pretreatment involving 1% (v/v) H_2SO_4 combined with autoclaving of FMS containing higher xylose concentration (7.8 g/L) than the xylose in the saccharified solution (2 g/L) was as the fermentation feed. *Pichia stipitis* NCIM-3497 was able to consume more xylose leading to 35% higher ethanol production in the presence of synthetic medium components except xylose in the detoxified hydrolysate than in the plain detoxified hydrolysate. Pyrolysis of the solid residue from the sulphuric acid treatment of FMS resulted in 41.98% (w/w) and 27.2% (w/w) of bio-oil and char, respectively. The bio-oil abundant valuable products like furfural, 1-(2-hydroxy-5-methylphenyl)-ethanone and 4-allyl syringol, which can be refined further for their applications in food and resin industries.