Abstract

Optimization of sachharification of cellulosic materials from cellulose using cellulolytic bacteria

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The major constituents of cellulosic waste products (saw dust and bonded papers) include cellulose (a β-1, 4-glucosan), hemicelluloses (primarily polymer of pentose) and lignin (a polymeric phenolic material). The intimate association of lignin with cellulose in nature severely restricts the hydrolysis of cellulose. Therefore the purpose of this study was to separate and prepare the cellulose for digestion by pretreatment of the cellulosic waste products. The cellulosic materials were pretreated with 1-5% H₂SO₄, solid and liquid in 1:4 ratio at 100°C for 15-20 mins. The pretreatment operation liberates cellulose allowing the enzyme to have better access to the cellulose. Saccharification of the enzymatic hydrolysis was carried out by cellulolytic bacteria from termite gut. The optimization condition for the saccharification of cellulosic waste products was conducted by the cellulolytic bacteria. A two step process optimization was done in small scale and large scale operation. The small scale optimization was operated in shaking incubator with respect to temperature and pH. Similarly, the temperature and agitation were also optimized in large scale using a bioreactor. The best results of the saccharification were obtained at 37°C with 0.8 & 1.2 degree brix in both small and large scale respectively & 0.57% & 0.13% of saccharification in both small and large scale respectively. Moreover, the optimum pH was 4.5 with 0.8 degree brix & 0.51% of saccharification in small scale and the optimum agitation was 100rpm with 1.2 degree brix & 0.13% of saccharification in large scale.

Key Words: Cellulolytic bacteria, Cellulose, Optimization, Saccharification.