Ethanol Production using Starting Material from Bacterial Cellulose and Cellulolytic Bacteria from Cow Dung

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Bioethanol is a renewable biofuel produced mostly via a fermentation process using sugars or cellulose as raw material. Bioethanol production from cellulosic plants is common, but it has several disadvantages such as the separation of undesirable matter (lignin) and using of hazardous chemicals. Therefore, our objective is to develop fast, simple, low-cost, and eco-friendly system, and improve yield for bioethanol production by using bacterial cellulose, obtained from culturing of Aceobacter xylinum with wastewater, as an alternative to plant cellulose. For conversion of cellulose to fermentable sugars, cellulolytic bacteria from cow's or termite's digestive tract are of particular interest as an effective source of cellulolytic enzymes. The ability of cellulolytic bacteria from cow dung or termite nests to convert cellulose to fermentable sugars and further use of the sugars for bioethanol production were investigated in this study. The results showed that that the cellulolytic bacteria from cow dung or termite nests were highly effective for cellulose hydrolysis, with bacteria from cow dung exhibited 34 % higher cellulolytic activity towards carboxymethyl cellulose than enzyme from termite nests. The optimal conditions for hydrolyzing bacterial cellulose were obtained when using 5 g (dry weight) bacterial cellulose per 100 ml cow dung at 72 hours incubation, yielding 370 mg reducing sugars/ g bacterial cellolose. Fermentation of the reducing sugars by Saccharomyces cerevisiae for 48 hours resulted in 1.7 mL (10.80% v/v) ethanol yield, cost only 0.36$ per liter.