Thermophilic, lignocellulolytic bacteria for ethanol production: current state and perspectives

Lignocellulosic biomass contains a variety of carbohydrates, and their conversion into ethanol by fermentation requires an efficient microbial platform to achieve high yield, productivity, and final titer of ethanol. In recent years, growing attention has been devoted to the development of cellulolytic and saccharolytic thermophilic bacteria for lignocellulosic ethanol production because of their unique properties. First of all, thermophilic bacteria possess unique cellulolytic and hemicellulolytic systems and are considered as potential sources of highly active and thermostable enzymes for efficient biomass hydrolysis. Secondly, thermophilic bacteria ferment a broad range of carbohydrates into ethanol, and some of them display potential for ethanologenic fermentation at high yield. Thirdly, the establishment of the genetic tools for thermophilic bacteria has allowed metabolic engineering, in particular with emphasis on improving ethanol yield, and this facilitates their employment for ethanol production. Finally, different processes for second-generation ethanol production based on thermophilic bacteria have been proposed with the aim to achieve cost-competitive processes. However, thermophilic bacteria exhibit an inherent low tolerance to ethanol and inhibitors in the pretreated biomass, and this is at present the greatest barrier to their industrial application. Further improvement of the properties of thermophilic bacteria, together with the optimization production processes, is equally important for achieving a realistic industrial ethanol production.

General information
Publication status: Published
Organisations: Microbial Engineering, Biosystems Division, Risø National Laboratory for Sustainable Energy
Contributors: Chang, T., Yao, S.
Pages: 13-27
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Applied Microbiology and Biotechnology
Volume: 92
Issue number: 1
ISSN (Print): 0175-7598
Ratings:
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 3.72 SJR 1.453 SNIP 1.24
Web of Science (2011): Impact factor 3.425
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
Original language: English
Keywords: Microbial organisms for energy
DOIs:
10.1007/s00253-011-3456-3
Source: orbit
Source-ID: 279799
Research output: Contribution to journal › Journal article – Annual report year: 2011 › Research › peer-review