54c Enhanced Ethanol Production from Food Processing Wastes Using Genetically Modified Cells

Kripa K. RAO, Vaibhav Chaudhari, Dong-Shik Kim, and Sasidhar Varanasi

Ethanol is considered as one of promising alternative energy sources, and there are ongoing efforts to increase the production yields and broaden the available resources. Significant advances are also being made towards the development of improved biocatalysts and more efficient process designs for ethanol production.

Utilization of the (polysaccharides in)waste streams from various bioprocess and food industries as feedstock for ethanol production has the potential to significantly improve the economies of these industries. The approach can not only provide a viable source of energy but also mitigate the expenses associated with the disposal of the waste streams of these industries.

In this project, we used waste water collected from various points in the food processing lines to produce ethanol using fermentation. Genetically modified organism, Escherichia. coli KO11, has been used to metabolize the complex sugar constituents from the biomass wastes. E. coli KO11 is capable of utilizing not only glucose (hexose sugar) but other sugars such as pentoses which are not directly metabolized by bakers yeast traditionally used for large scale ethanol production. The process waste water contained a combination of unhydrolysed starches and complex sugars. Saccharification enzymes such as *f*Ñ-amylase and glucoamylase were used to hydrolyze these starches.

Hydrolysis and fermentation were simultaneously carried out in a 4-L fermentor under continuous control of pH and temperature. This paper will address the benefits of concomitantly employing efficiently-fermenting-bacteria "E. coli KO11" along with amylolytic enzymes in the simultaneous saccharification and fermentation (SSF) of the renewable and abundantly available food processing waste water.