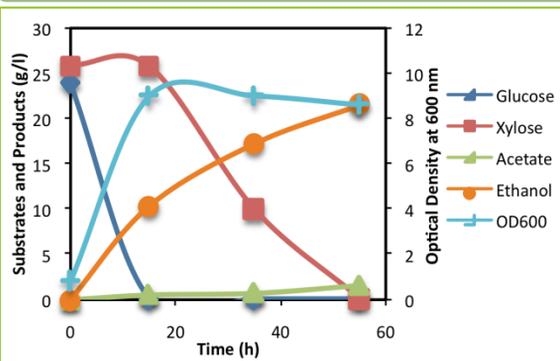


## Pathways to Enhance the Production of Bioalcohols in Bacteria

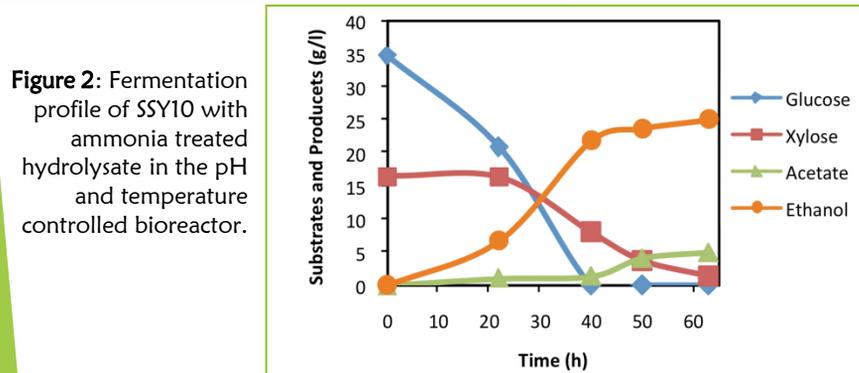
A novel *Escherichia coli* strain (SSY05) was constructed by engineering the native pathways to produce high yield of ethanol from hexose and pentose sugars. Pyruvate dehydrogenase (PDH) operon expression was induced under anaerobic conditions through gapA promoter, which yielded high PDH activity and hence the improved ethanol yield.

Further deletion of genes responsible for competing products such as lactate, succinate, acetate and formate, led to further improvement of yield. These deletions, however, led to significant reduction in cell growth rate under anaerobic condition. Introduction of basal level of acetate kinase activity in the final engineered strain (SSY10) regained cell growth rate. This rate was further improved under microaerobic condition and resulted in the production of ~22 g/l ethanol from a mixture of glucose and xylose, each at ~25 g/l, with the maximum volumetric productivity of 0.7 g/l/h (15 mmol/l/h), respectively, at a greater than 85% theoretical yield. Similar yield and productivity of ethanol was achieved when biomass hydrolyzate containing C5 and C6 sugars was used.

### Graphical Description



**Figure 1:** Fermentation profile of SSY10 in LB medium at 50 g/l glucose+xylose in the pH and temperature controlled bioreactor.



**Figure 2:** Fermentation profile of SSY10 with ammonia treated hydrolyzate in the pH and temperature controlled bioreactor.

### Exploitable Technology

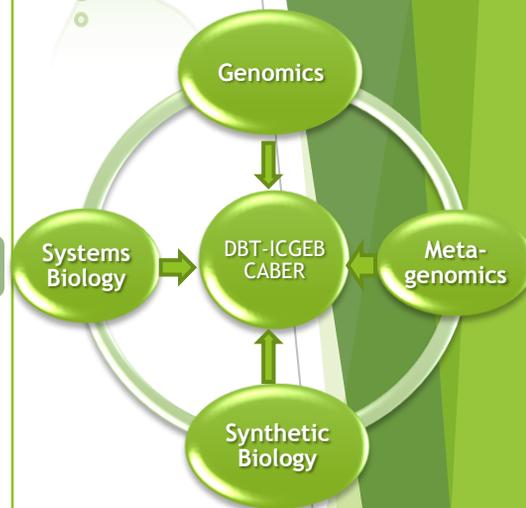
The lab scale fermentation technology is now ready to be upscaled industrially to meet the energy needs of human beings.

### Reference for the Invention

Syed Shams Yazdani, Neha Munjal And Anu Jose Mattam. 2012. Engineering Native Pathways to Enhance Production of Bioalcohols in Bacteria. Indian Patent Application No. 2696/DEL/2012.  
 Munjal, N., Mattam, A.J., Pramanik, D., Srivastava, P.S., Yazdani, S.S. 2012. Modulation of endogenous pathways enhances bioethanol yield and productivity in *Escherichia coli*. *Microbial Cell Factories* 11(1):145.



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