

β -Glucosidase for biofuel application

Technology Summary:

β -Glucosidase (BGL) is a key ingredient in the enzyme blends used for biomass hydrolysis for bioethanol production. It is the rate limiting enzyme in the cellulase complex. Cellulases for hydrolysis of biomass are typically sourced from fungi like *Trichoderma reesei* whose cellulases lack sufficient quantities of this important enzyme. Commercial preparations of cellulase contain BGL from heterogeneous sources. *Aspergilli* are used as sources of BGL. Globally, there are only few suppliers of BGL for biomass hydrolysis. BGL in these preparations are inhibited by high concentrations of glucose. CSIR-NIIST had isolated a filamentous fungus from decaying wood in 2005, which was identified as *Aspergillus niger* and designated isolate no. NII 08121. The fungus produced a BGL which was active at 0.5M glucose and had a glucose inhibition constant (K_i) of 0.2M. The technology developed is a solid state fermentation process for production of NII 08121 BGL.

Description:

CSIR-NIIST researchers have isolated an *Aspergillus niger* culture which produces moderately glucose tolerant β -glucosidase useful in biomass hydrolysis. A process for production of the enzyme using solid state fermentation technology was developed and demonstrated at lab scale. The enzyme was tested successfully in blends with both *Trichoderma* and *Penicillium* cellulases for hydrolysis of lignocellulosic biomass. In both these cases and in commercial cellulase formulations, addition of BGL to cellulase significantly enhanced the final sugar yield and reduced the time required to attain maximal sugar yield. Lab scale process for production of this enzyme using solid state fermentation is ready and further work is ongoing for developing a technology for large scale production of the enzyme. There is only one enzyme manufacturing company in India having a listed portfolio with BGL, and this indicate ample scope for commercialization.

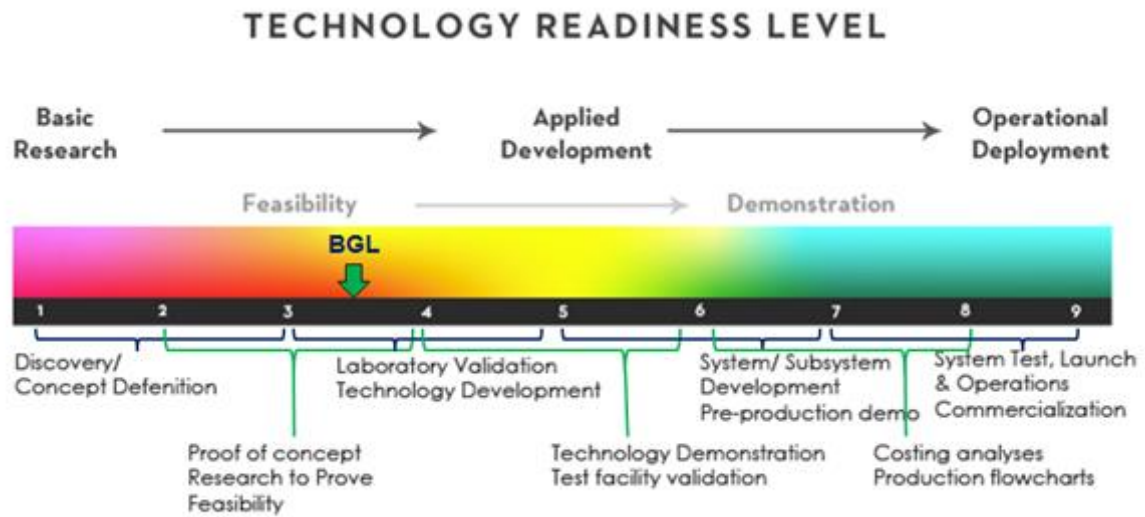
Benefits

- BGL is produced in high titres and require lesser time to produce
- Enzyme is moderately glucose tolerant and highly stable.
- Enzyme is active at 60 °C
- Supplementation of the BGL to cellulases improves their biomass hydrolysis efficiencies and the time needed to achieve maximum sugar yield.

Applications/Industries

Biofuels, Biomass conversion, Enzymes

Technology readiness Graph



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