

Rhizopus enzymes and expression systems

A. What is this technology?

Rhizopus oryzae is a filamentous fungus that has multiple enzymes that are valuable for the conversion of crop residues to simple sugars for use in the production of biofuels and other valuable products. This technology is two-fold in that it utilizes enzymes (polygalacturonases) isolated from *Rhizopus* for use as processing aids in biomass conversion and a protein expression system to overcome issues related to the high cost of enzyme production.

B. What problem does it address?

- The polygalacturonase enzymes are required to breakdown pectin, a major component of plant cell walls and citrus rind, and ultimately enable access of additional enzymes to convert crop residues to simple sugars.
- The *Rhizopus* expression system addresses problems related to cost and productivity of enzymes, a major impediment to efficient and cost-effective production of biofuels and valuable products from crop residues.

C. What is the significance of this solution?

The polygalacturonase enzymes will be required to completely convert many different biomass sources and provide an opportunity to gain valuable products from unlikely sources. The enzyme expression system provides an opportunity to overcome issues related to productivity and cost in the production of enzymes associated with current expression systems.

D. Who could use this technology?

The polygalacturonase enzymes are of value to those interested in conversion of crop residue and wastes to biofuels and value-added products. In addition, the enzymes are important for the clarification of juices, production of linens, and potentially the pulp and paper industry. The *Rhizopus* expression technology potentially provides an opportunity to produce proteins and/or enzymes of importance to bioprocessing and other industries in a cost-effective manner.

E. How is this technology unique?

The polygalacturonase enzymes are very stable, more so than what is generally available in the market. *Rhizopus* protein expression provides a system to efficiently produce and recover enzymes and proteins of interest.



Stage of Development

Development and complete characterization of the polygalacturonase enzymes continues and will be completed shortly. Development of the protein expression system has moved past the proof of concept stage, details of the expression system have been published, and the system may be available for license as a biological material.

Moving Forward

Application testing of the polygalacturonase enzymes will be initiated in the next phase of research. Collaborative efforts and support will be welcomed to facilitate this work. The *Rhizopus* protein expression system is currently being used with both native and foreign proteins, although additional improvements are being investigated.

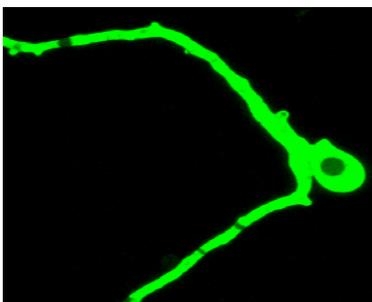


Researchers

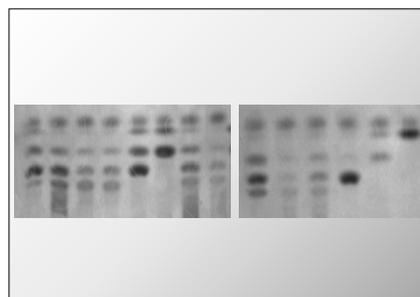
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Rhizopus oryzae expressing Green Fluorescent protein



Hydrolysis of polygalacturonic acid via polygalacturonase

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