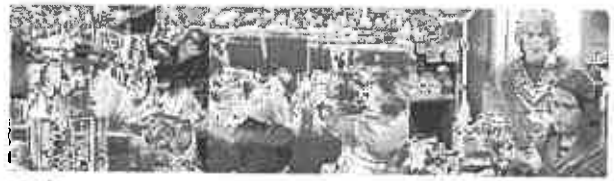

Research

Research Project: Developing Bioconversion Processes for High-Value Carbohydrate Products

Location: Fermentation Biotechnology Research

Project Number: 3620-41000-109-00
Project Type: Appropriated

Start Date: May 28, 2004
End Date: May 27, 2009

Objective:
To develop biocatalytic methods for the conversion of crop derived carbohydrates to high value polysaccharides or oligosaccharides. The project will be composed of two major objectives. Their common feature is the use of agriculturally derived carbohydrates for the production of high-value products which utilize some of the structural features of the original carbohydrates.

Approach:
Glycansucrases. Our research in this area will focus on the use of alternansucrase to synthesize oligosaccharides via transfer of glucosyl units from sucrose to mono- or oligo-saccharide acceptors. As alternansucrase is better at catalyzing acceptor reactions than commercial dextransucrase, yielding a better variety of mixed-linkage products, we will first focus on this enzyme. The newly synthesized oligosaccharides are expected to support the growth of specific beneficial microbes in the gastrointestinal tract. We will develop these and other products and determine their structures. The role of oligomer structure and size (degree of polymerization) in fermentability and prebiotic activity will be investigated. This is expected to yield not only new, more strain-specific prebiotics, but will also give rise to a better understanding of the mechanism of prebiotic action. Corn coproducts. This research will utilize abundant, low-value agricultural biomass, particularly

Project Team

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Publications

Related National Programs

- Quality and Utilization of Agricultural Products (306)

Related Projects

- Fermentative Production of Novel Carbohydrates
- Improved Utilization of Corn Fiber
- Utilization of Unique Oligosaccharides by Colonic Bacteria

corn fiber arising a coproduct of corn wet milling for productio of starch, sweeteners, and ethanol. This is attractive as a model corn residue because it accumulates in enormous volumes in milling facilities and does not need to be collected and transported from fields as do corncobs and stover. Research will also utilize DDGS, an abundant low-value coproduct of dry grind fuel ethanol production. Both corn fiber and DDGS are rich in arabinoxylan, a complex polysaccharide with a backbone of B-(1,4) linked xylose and various side chains and other modifications. Combinations of specific enzymes will be used to cut corn fiber xylan at these linkages to produce a collection of novel oligosaccharides. Gum arabic substitutes. The goal will be to optimize the synthesis of protein-polysaccharide conjugates. Reaction conditions for the formation of protein-polysaccharide conjugates will be screened to optimize the yield of the reaction while limiting undesirable coproducts. BSL-1; Recertified October 1, 2003.