Bioconversion of Starch and Sucrose into Value-added Products

Marc J.E.C. van der Maarel, Groningen (The Netherlands)

Summary

Starch and sucrose are renewable resources that can be used to make various polysaccharides with interesting functional properties. They are derived from agricultural crops including sugar beet, corn, wheat and potato. Starch derivatives are used in a large variety of food and non-food products such as puddings, oil drilling fluids, glues etc. Sucrose is a disaccharide of fructose and glucose that is abundantly present in sugar beet and sugar cane. Sucrose finds various applications in mainly the food industry. Starch and sucrose can be modified into novel polysaccharides with interesting functional properties using respectively bacterial glucanotransferase or sucrase type of enzymes. These enzymes break the glycosidic linkage present in starch and sucrose and transfer part of the donor molecule onto a new saccharide acceptor. At the business unit Food and Biotechnology Innovations of TNO Quality of Life we have developed various novel functional polysaccharides using such enzymes. With the 4-alpha-glucanotransferase of thermophilic bacterium Thermus thermophilus a thermoreversible gelling starch derivative was produced.

This new functional ingredient was released on the market by AVEBE under the name Etenia® in 2007 as a plant-based alternative to gelatin. Sucrose was converted into glucans of the reuteran and dextran type using various food grade Lactobacillus strains. Reuteran, a glucan with both alpha,1-4 and alpha,1-6 glycosidic linkages, can be used as bread improver or as weight management ingredient, helping in the fight against obesity. Several of these Lactobacillus strains will be marketed as starter cultures by a large food ingredient company. Another potential outlet for these glucans is their use in heavy duty coatings to protect ship hulls against corrosion. It turned out that several of these glucans have anti-corrosive properties making them a biofriendly alternative to heavy metals used in coatings. These examples of new functional polysaccharide products illustrate that the commodity carbohydrates starch and sucrose can be converted into high value products using a biocatalytic or bioconversion process. This offers a more sustainable and durable alternative to the current use of starch and sucrose as a resource for the production of fermentable sugars for the bioethanol industry.

Beamer-Presentation shown at the meeting.

Address of author:

Dr. Marc van der Maarel
TNO Nutrition and Food Research
Rouaanstraat 27
NL-9723 CC Groningen
The Netherlands