Cross-Linked Amylose Bio-Plastic: A Transgenic-Based Compostable Plastic Alternative - DTU Orbit (17/12/2018)


Bio-plastics and bio-materials are composed of natural or biomass derived polymers, offering solutions to solve immediate environmental issues. Polysaccharide-based bio-plastics represent important alternatives to conventional plastic because of their intrinsic biodegradable nature. Amylose-only (AO), an engineered barley starch with 99% amylose, was tested to produce cross-linked all-natural bioplastic using normal barley starch as a control. Glycerol was used as plasticizer and citrate cross-linking was used to improve the mechanical properties of cross-linked AO starch extrudates. Extrusion converted the control starch from A-type to Vh-and B-type crystals, showing a complete melting of the starch crystals in the raw starch granules. The cross-linked AO and control starch specimens displayed an additional wide-angle diffraction reflection. Phospholipids complexed with Vh-type single helices constituted an integrated part of the AO starch specimens. Gas permeability tests of selected starch-based prototypes demonstrated properties comparable to that of commercial Mater-Bi(C) plastic. The cross-linked AO prototypes had composting characteristics not different from the control, indicating that the modified starch behaves the same as normal starch. The data shows the feasibility of producing all-natural bioplastic using designer starch as raw material.

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