Potential of the small-granule starch mutation for the bioethanol industry

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The industrial starch market is undergoing major expansion, but certain specific industrial uses cannot be satisfied by native starches and, therefore, chemical or physical modification is necessary. Mutations in the cassava starch biosynthesis pathways were discovered at CIAT (Cali, Colombia) few years ago. A starch mutation induced by gamma rays radiation resulted in a deeply modified branching pattern of amylopectin as well as other starch characteristics and properties. These modifications include changes in starch granule ultrastructure (e.g. decreased starch crystallinity), a weak organized structure, and increased susceptibility to mild acid and enzymatic raw starch hydrolysis (fastest and most efficient hydrolysis of all studied native starches). This mutation could offer interesting advantages for the production of bioethanol. Surprisingly this mutation also results in increased proportion of amylopectin. Hydrolysis was more dependent on granule morphology than on starch chemical composition. Recent crosses produced segregating progenies whose starch had the small-granule characteristics, but amylopectin content ranged from 19 to 42%. Rapid viscoamylograms of the latter starch showed very distinctive patterns.