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STARCH-SUGAR TRANSFORMATION ON SWEET AND STAPLE-TYPE SWEET POTATOES

(Transformation amidon-sucre chez la Patate douce sucrée et non sucrée)

Franklin W. MARTIN

Tropical Agriculture Research Station, Southern Region
Agricultural Research Service, U.S.
Department of Agriculture
Mayaguez, Puerto-Rico

SUMMARY

Normally sweet potatoes contain reducing and non-reducing sugars. Cooking increase reducing but non-reducing sugars through activation of the beta-amylase enzyme. A new class of sweet potatoes (staple-type) has been produced by breeding that is not sweet or only slightly sweet after cooking. In these sweet potatoes reducing sugars are not increased or only slightly increased by cooking. Examination for amylase on acrylamide gel, with or without electrophoresis reveals that there is one spot active in hydrolysis of starch in normal sweet potatoes, and that this spot is weak or absent in staple-type sweet. Isolated starches from staple-type sweet potatoes were partially hydrolyzed when mixed with fresh normal sweet potato and cooked. Starches from normal sweet potatoes contained traces of enzyme that could hydrolyse them on cooking. In cooked mixtures of an enzyme-free starch from a staple-type sweet potato, the former was able to liberate reducing sugars from the latter.

RESUME

Les patates douces contiennent normalement des sucres réducteurs et non réducteurs. La cuisson augmente les sucres non réducteurs par activation de la beta-amylase. Une nouvelle classe de patates douces peu ou pas sucrées après cuisson a été obtenue par amélioration génétique. Les teneurs en sucres réducteurs de ces dernières sont peu affectées par la cuisson. L'examen de l'amylase, sur gel d'acrylamide, ou avec électrophorèse montre une seule bande, active dans l'hydrolyse de l'amidon des patates douces normales, faible ou absente chez les patates douces peu ou non sucrées. Les amidons isolés de patates type aliment de base furent partiellement hydrolysées en cuisson, mélangés avec des patates fraîches normales. Les amidons des patates douces

normales contiennent des traces d'enzyme qui les hydrolisent au moment de la cuisson. L'enzyme d'un amidon de patate douce normale est capable lorsqu'elle est ajoutée à un amidon de patate douce non sucrée dont elle est absente d'en libérer des sucres réducteurs.

INTRODUCTION

The sweet potato, *Ipomea batatas* (L.) Poir., produces a tuberous root that contains starch as its principal constituent. During cooking the starch is converted to dextrins (short chain starch residues) and the reducing sugar maltose (HAMMETT and BARRENTINE, 1961). This conversion occurs in the presence of Beta amylase, an enzyme very active at cooking temperatures (KAINUMA and FRENCH, 1970). Beta-amylase is obtained commercially from sweet potatoes and is presumed to be active in all varieties.

Recently a sweet potato cultivar, Ninety-nine, was reported in which the starch is not converted to maltose by cooking (MARTIN and RUBERTE, 1983). The tuberous root of this cultivar is not sweet after cooking. Studies of the reducing power of the starch and its intrinsic viscosity suggested that the starch of this variety occurs as long, unbranched molecules (MARTIN and DESHPANDE, in press).

Since the initial finding of the cultivar Ninety-nine, many selections have been made of non-sweet and low-sweet potatoes are now called staple-type as a new staple, with sufficient potential attraction to the consumer as well as nutritive value, to be used as an everyday food.

The difference among sweet potato varieties that accounts for the non-sweet or low-sweet condition is attacked here by study of the starch-sugar transformation process in sweet and staple-type sweet potatoes.

MATERIALS AND METHODS

The experimental materials consisted of 13 cultivars of sweet potato developed at the Tropical Agriculture Research Station, Mayaguez, Puerto Rico. The reducing sugar contents of typical tuberous roots of these varieties are given in Table 1. On the basis of observed sweetness after cooking the cultivars had been classified by the investigator as staple (no sweetness perceived), sub-staple (only slight sweetness perceived), tropical (typical sweet potato of the tropics, white or yellow in color), and dessert (sweet and orange in color) (it must be remembered that sweetness depends as well on the presence of non-reducing sugars, not studied herein, and on individual differences in the threshold of perception of sweetness). Two of the cultivars were selected as typical of the extremes, Ninety-nine, the cultivar in which