Simple Solution to Cold-Induced Sweetening in Potatoes Stored at Low Temperatures

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing modified potatoes that do not develop cold-induced sweetening during cold storage.

OVERVIEW

Potato tubers must be stored at a low temperature (five to 10 °C) to prevent sprouting, reduce respiration and minimize disease loss. However, cold storage triggers the conversion of starch to glucose and fructose, a phenomenon known as cold-induced sweetening (CIS). Potato chips and french fries produced from cold-stored potatoes with elevated amounts of sugars are unacceptably brown- or black-colored and bitter tasting and may have elevated levels of acrylamide, a potential carcinogen.

The biochemical and molecular mechanisms of CIS have been studied extensively, and it has been documented that the vacuolar invertases, which convert sucrose to glucose and fructose in potato tubers, may play a key role in CIS. Yet our understanding of how this biochemical process is controlled remains limited. It was believed to be an extremely complex quantitative genetic trait and potato breeders have made only limited progress toward improving it. No commercially acceptable potato varieties that can be processed directly from four to five °C cold storage have been developed.

THE INVENTION

UW–Madison researchers have developed a simple method of modifying potato plants to control CIS. They used an RNA interference (RNAi)-based approach to silence the potato vacuolar invertase (VI) gene and found a direct correlation between the lightness of the chip color and the amount of VI gene transcripts. By blocking the VI gene, they were able to produce potatoes that could be processed directly out of cold storage. Potato chips processed from the VI gene silenced lines also contain significantly reduced levels of acrylamide.
APPLICATIONS

• Production of chips, french fries and other fried foods from cold-stored potatoes

KEY BENEFITS

• Provides a simple method of controlling CIS
• Results in commercially acceptable fried potato products
• Silencing the VI gene did not affect growth, yield, specific gravity or tuber morphology.
• Reduces acrylamide levels in fried potato products
• Applicable to sweet potato, yam and Cassava products as well

ADDITIONAL INFORMATION

Publications

Click here for a news release describing this technology.

Tech Fields
Agriculture - Plant biotech

CONTACT INFORMATION

For current licensing status, please contact Emily Bauer at emily@warf.org or (608) 262-8638.

FIGURES

In contrast to chips from control (Katahdin) tubers, chips obtained from modified tubers did not develop CIS.