Simmondsin From Jojoba Checked for Appetite Suppression

Harvesting a natural appetite suppressant from jojoba (pronounced *ho-ho-bah*) may give U.S. farmers one more reason to grow the plant, which is native to the Sonoran Desert in Arizona and Mexico. Jojoba oil is already a popular ingredient in cosmetics and shampoos.

But jojoba meal, left over after oil extraction, was thought to contain compounds toxic to animals. The reason: Weanling mice ate less and lost weight on a diet containing 15 percent jojoba meal.

In the 1990s, Belgian researcher Marnix Cokelaere discovered that simmondsin acted as a hunger satiation ingredient. This allowed him to reinterpret earlier experiments with mice and cattle fed diets supplemented with jojoba meal. Rather than being toxic, the ingredient satisfied the animals' hunger, causing the decline in feed intake. Cokelaere is now examining the prospect of a positive outcome from the earlier negative results: a safe appetite suppressant.

Researchers at the ARS National Center for Agricultural Utilization Research in Peoria, Illinois, are working with Belgian scientists to study how simmondsins are metabolized. In Belgium, ARS agricultural engineer Ronald A. Holser attached a chemical label to simmondsin to identify its breakdown products. The purpose was to understand the mechanism by which simmondsin affects hunger by tracking its metabolism in laboratory rats.

"When we learned that simmondsin was a hunger satiation ingredient, we had already been working on making its protein more valuable as a cosmetic ingredient," says New Crops research leader Thomas P. Abbott. In 1999, Abbott and his team patented a process of isolating and extracting simmondsin from jojoba meal. Since then, they've used the process to produce larger quantities of the most bioactive type of simmondsin.

Jojoba meal has 25 to 30 percent protein, making it a nutritious feed for cattle—once the simmondsin is extracted. Before the extraction process was developed, most jojoba meal was buried in landfills as waste. Each year 3 million pounds of jojoba seeds are harvested in the United States. Jojoba oil sells for $30 a pound, representing a market value of $30 million.

"If simmondsin is shown to be a safe appetite suppressant for humans, we will have derived yet another valuable product from jojoba," says Abbott.—**By Linda McGraw,** ARS.

Thomas P. Abbott and Ronald A. Holser are in the USDA-ARS New Crops Research Unit, National Center for Agricultural Utilization Research, 1815 N. University St., Peoria, IL 61604; phone (309) 681-6533 [Abbott], (309) 681-6213, [Holser], fax (309) 681-6524, e-mail abbotttp@mail.ncaur.usda.gov, holserr@mail.ncaur.usda.gov. ◆

Tomatoes That Age Gracefully

Six years ago, the tomato industry thought it had a fresh-market winner—a tomato that could be left to ripen longer on the vine and still remain firm through a couple of weeks of shipping, handling, and sitting on the shelf. But the genetically engineered Flavr Savr tomato was poor tasting and costly to produce, so it shriveled on the vine.

With the growing competition in today's fresh-tomato market—worth nearly $1 billion in 1999—the time is ripe for a tomato that ages gracefully. Researchers in ARS' Horticultural Crops Quality Laboratory at Beltsville, Maryland, are closer to providing the industry with the needed tools—a clearer picture of some of the genes involved in turning a nice, firm tomato into an undesirable, mushy one.

In their first success, Kenneth C. Gross, who heads the lab, and molecular biologist David L. Smith have produced ripe tomatoes that are 40 percent firmer than unmodified siblings and stay firmer for at least 2 weeks. The researchers inserted the backward version of the gene for an enzyme that removes the sugar galactose from cell walls. Galactose is a component of pectins, a major part of the scaffolding of cell walls. Structurally sound cell walls are essential to tomato firmness, explains Smith, and the loss of galactose appears to play a key role in the loss of structural integrity.

The concept is similar to that used for the Flavr Savr tomato, but it targets a different component of pectin, says Smith. "We're focusing on galactose because it's the sugar that changes most throughout fruit development."

The two scientists identified and sequenced seven different genes that code for the galactose-removing enzyme—beta-galactosidase. U.S. and international patent applications on all seven genes have been filed for ARS, citing Gross and Smith as the inventors. The two have inserted five of those genes into the tomato genome. But so far they have tested tomatoes from only one of the reversed, or antisense, genes—number 4.

"We want to know why there are seven of these genes," says Gross. "All are turned on during development, but they have different patterns of expression. Maybe they have other functions," he says, noting that one may affect fruit color.

"We want to change one thing without changing anything else," Smith adds. He and Gross also want to find other genes involved in fruit softening in hopes of further improving firmness or viscosity. Tomato canners love viscous, or nonwatery, tomatoes because less cooking is needed to produce thick sauce.

Lessons learned from the tomato—the most popular model for studying the ripening process—could lead to firmer peaches or crisper apples, notes Smith.—By **Judy McBride,** ARS.

Kenneth C. Gross and David L. Smith are with the USDA-ARS Horticultural Crops Quality Laboratory, 10300 Baltimore Blvd., Bldg. 002, Beltsville, MD 20705-2350; phone (301) 504-6128; fax (301) 504-5107; e-mail grossk@ba.ars.usda.gov, smithd@ba.ars.usda.gov. ◆