CROP BREEDING FOR TRAIT ENHANCEMENT AND DISEASE RESISTANCE

ARS advances multiple crop industries by developing new crop varieties with disease resistance and other trait enhancements and providing new tools and approaches that will support future breeding efforts. In addition to supporting major commodities, ARS breeding programs advance specialty crops, which alone have a U.S. farm gate value of $87.7 billion. The following accomplishments are examples of ARS advances in crop breeding for disease resistance and trait enhancement in FY 2019.

New tomato flavor gene discovered. Tomatoes are the most valuable fruit crop in the world, and Americans consume an average of 70 pounds of tomatoes per person annually. ARS researchers in Ithaca, New York, identified a rare version of the TomLoxC gene that contributes to tomato flavor by catalyzing the synthesis of aromatic compounds that consumers prefer. This trait is of great interest to breeders attempting to address consumer demands for more flavorful tomatoes.

World's first red leaf spinach. ARS researchers in Salinas, California, developed 'USDA Red', the world's first spinach variety with red color on the surface of the leaves. In field trials conducted between 2015 and 2018, 'USDA Red' on average had 65 percent higher betacyanin content and 53 percent higher antioxidant capacity than red-veined spinach cultivars. The betacyanin adds another punch to a plant already loaded with phytonutrients, making red leaf spinach a true "super food." The red spinach may bring some excitement to the spinach market and attract consumers to the colorful new product.

A new table grape. ARS researchers in Parlier, California, have released a new early season, black-skinned seedless table grape named 'Solbrio' that has large, fully-colored berries and crisp and crunchy flesh. Growers are very pleased with the new variety, which is both easy and inexpensive to grow.

New seedling screening method for *Phomopsis* seed decay in soybean. ARS researchers in Stoneville, Mississippi, developed a new method to rapidly screen soybean seedlings for resistance to *Phomopsis* fungi. *Phomopsis* causes seed decay and can result in both seed yield and quality losses. Unlike previous methods, this new assay can identify resistance to *Phomopsis* without waiting an entire growing season. Public soybean breeders and laboratories in the United States and in China have adopted this method.

More efficient method for analyzing genetic data for tree breeding. DNA analyses of trees at the seedling stage can increase the efficiency and reduce the costs of tree breeding. ARS researchers in Miami, Florida, and collaborators developed a more efficient method of analyzing DNA data for mango and avocado that can distinguish specific cultivars of interest, identify traits to remove from breeding stocks, and optimize breeding efficiency.