FORUM

Breeding Rootstocks To Help Apple Growers

Today's apple growers face a host of challenges. Some challenges come from nature and some from our own changing tastes. Walk through any supermarket produce section or stop by any farmer's market and, depending on the season, you are likely to see a vast assortment of apple varieties. We want apples that not only ship and store well, but taste good when eaten fresh; baked into pies and pastries; or used in jellies, candies, or other products. This unprecedented variety is the result of decades of efforts by breeders, nurseries, and growers in response to changing consumer tastes and demands.

But such bounty comes at a price. Some of our most popular apple varieties are susceptible to a number of diseases and pathogens, which makes producing them a challenge. Gala, Honeycrisp, and Fuji are susceptible to fire blight, a bacterial disease that can kill a tree. Apple replant disease is found in orchard soils used to grow the same crop year after year. Many of the nation's most productive orchards have produced apples for decades, making the disease a serious problem. Many of the apple rootstocks traditionally used were bred in England decades ago and are not equipped to deal with today's demands.

Fortunately, a unique apple rootstock-breeding program in Geneva, New York, is helping growers meet these modern-day challenges. Agricultural Research Service researchers at the Plant Genetic Resources Unit in Geneva, along with their partners at Cornell University, have bundled resistance to several threats into new rootstock varieties. The accomplishments are described in this issue on page 4. To better understand the significance of the work, and the stakes involved, it helps to know more about how apples are produced.

Apples are a $3.1-billion-a-year industry in the United States. They are grown commercially in 29 states, and they rank second, behind oranges, as the nation's most consumed fruit, when fresh and processed uses are combined. Apple trees in commercial orchards, like other fruit trees, are bred in two parts: the fruit-bearing scion at the top and the rootstock that forms the foundation and roots. The dual approach makes the fruit and root systems easier to breed. The scion determines the variety of apple. The rootstock determines the tree's overall size, when it will first bear fruit, and its ability to resist many diseases. Rootstocks forage the soil for nutrients, which are critical to the tree's survival, health, and productivity.

Along with fire blight and replant disease, other major threats to apple producers include woolly apple aphids and winter cold; in some apple-producing areas, winter temperatures can dip to –20°F. But of all these, the most serious threat may be fire blight. The disease is bacterial, and once a tree is infected, no pesticide of any kind will help. Fire blight likes hot, humid conditions, and when it gets into a 2- to 4-year-old "juvenile" tree, it can kill it quickly. Unfortunately, some of the most popular varieties of apples, including many from Washington State, which produces half of the nation's apples, are susceptible to it. The best defense is to use resistant varieties and rootstocks.

Nurseries often buy rootstocks when they are about the size of a pencil, graft scions onto them, and grow the plants for a few seasons before selling them. Typically, orchard operators buy some new trees from nurseries every year, and over the course of about 20 to 25 years they gradually replace all of their trees. The grower's choice of rootstock is as critical as the apple variety produced. Sometimes growers are reluctant to switch rootstocks. They know that a rootstock that performs well in one type of soil may not be as successful in another. They are learning, however, that they can reduce their risks by using Geneva rootstocks. There are about 2.4 million new Geneva rootstock trees available to growers each year, but by some estimates, growers would use about 10 million if they were available.

Individual rootstock plants, however, are grown from mother plants, and it takes about 4 to 5 years to deliver quality rootstocks. While the nation's nurseries cannot replace all of their rootstock plants overnight, they are moving as quickly as possible to provide Geneva rootstocks to the growers who want them.

The development of apple rootstock in Geneva is a success story. The demand for it serves as testimony to the role played by ARS scientists in helping apple growers provide the nation with this tasty and nutritious fruit.

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