Grant could hasten adoption of dwarfing rootstocks

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When apple grower Joe Nuciforo plans for the future, he thinks about the part of his orchard that's underground.

"Rootstocks are probably one of the most critical decisions we have with our plantings going forward," said Nuciforo of Indian Ladder Farms in Altamont, New York. He grows 30 varieties and sees a significant need for continuing to develop new and better dwarfing rootstocks.

Lailiang Cheng at Cornell University would agree. A professor of horticulture with a specialty in nutrition physiology, Cheng just landed a $4.3 million USDA grant to hasten the adoption of new rootstocks in high-density orchard systems. The five-year project aims to help U.S. growers minimize what could amount to $300 million in lost revenue each year due to replant diseases and other stresses.

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According to Cheng, developing a new rootstock with traditional methods takes 25 to 30 years.

"That's why we need to accelerate the process," he said.

Orchardists with high-density plantings on dwarfing rootstocks want small, disease-resistant, precocious trees capable of producing high-quality fruit. That's hard to get, but it's precisely what the project hopes to achieve.

Cheng said more than 85 percent of apple trees planted in the past 20 years in U.S. commercial orchards are on M.9, B.9 or M.26 rootstocks. None of these tolerate biotic stresses, such as fire blight and replant diseases, very well. To prevent replant diseases, growers have traditionally fumigated the soil, but worker safety, cost, efficacy and environmental degradation pose problems. Cheng believes that new rootstocks tolerant of replant disease can reduce the need for fumigation, which benefits both the apple industry and the environment.

Cheng has assembled a team of 12 researchers from Cornell University, Michigan State University, USDA, Utah State University, the University of Idaho and Washington State University. Many are part of the NC-140 Cooperative Rootstock Research Project – ongoing

Bitter pit on Honeycrisp is a physiological disorder related to calcium deficiency in the fruit. Photo: Lailiang Cheng

since the mid '70s – that Cheng hopes to build on. That project's 2010 Apple Rootstock Trial involved more than 30 scientists who planted 28 new dwarfing rootstocks (Budagovsky, Cornell-Geneva and Pillnitz) grafted to either Honeycrisp or Fuji scions. Preliminary results from the 19 sites in North America and Mexico show that about a third of the rootstocks are good performers.

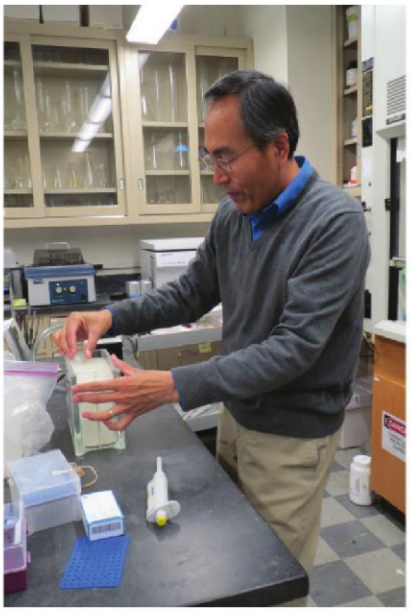
Cheng's project team will use some plantings in that 2010 trial to get data quickly on tree nutrient status, fruit quality and tolerance to biotic and abiotic stresses. This spring, they'll establish new plantings focusing on Honeycrisp, Gala, Fuji and novel varieties like Cosmic Crisp from Washington state.

One reason the team picked Honeycrisp – a variety Cheng described as "high value, but difficult to grow"– is its susceptibility to bitter pit (a physiological disorder related to calcium deficiency). He and his collaborators will study nutrient uptake and partitioning of calcium and other nutrients; they'll also identify rootstocks that confer better fruit quality and lower bitter pit incidence.

"We think most of the calcium goes to the leaves, making less calcium available to the fruit," Cheng said.

His team will use field-grown and container-grown trees to assess how rootstocks affect nutrients in the tree and fruit. They will also develop genetic markers that can be used by the rootstock breeding program in Geneva, New York. Cheng predicts that if improved rootstocks and management protocols are matched with new cultivars, growers could not only decrease disorders like bitter pit and internal browning but increase marketable yields by 20-25 percent.

In keeping with a "you talked, we listened" philosophy, Cheng and his team based the new project on priorities



Lailiang Cheng in his lab with a vacuum manifold. Photo: C. Koplinka-Loehr

set by NC-140 and industry and grower groups, including the International Fruit Tree Association, Washington Tree Fruit Research Commission, New York Apple Research and Development Program, Michigan Apple Committee, Northwest Nursery Improvement Institute and U.S. Apple Association. The researchers will receive guidance from two advisory committees: one of stakeholders and the other of scientists. These committees will provide feedback as project team members use Twitter, eXtension, webinars and Extension meetings to share new information with apple growers.

What will be the biggest challenge?

"We are at the mercy of Mother Nature," said Cheng, recalling last April's freeze that significantly affected New York's tree fruit.

But he believes the five-year timeline and geographic breadth of his project will help ensure success.

Multiple sites will probably minimize risk, Cheng said. FGN