Breeding For Disease Resistance Is A Difficult But Worthy Task

Challenges In Developing Disease-Resistant Cultivars
For decades, various tree fruit breeding programs around the world have worked hard to develop disease-resistant cultivars. While several resultant cultivars have been released with enhanced tolerance or even resistance to one or more of these primary diseases, they represent a distinct minority of the cultivars offered by most U.S. wholesale nurseries. Often, these resistant/tolerant cultivars are planted in smaller acreages and are designated for a particular market niche.

Why is this? Sometimes, the grower’s reason for not choosing them is because of some real or perceived deficiency in one or more critical production or quality factors (e.g., reliability of cropping, biennial bearing, fruit appearance, color, size, sweetness, maintaining firmness, ripe date, sensitivity to bruising, rate of softening, postharvest storage performance, etc.). When compared with the other disease-susceptible cultivars that may have both high consumer appeal and price points, it may be worth taking the risk to grow the latter.

Or, it may be that resistance to only one disease while susceptibility to another may not provide sufficient economic benefit if there are other deficient factors as already noted. In some cases, single site resistance mechanisms in resistant cultivars have been overcome by the pathogen over time (e.g., the Vf resistance gene for apple scab, Venturia inaequalis). I was acutely aware of the challenges for disease management while previously working with peach growers in the humid Southeastern U.S. There were no commercially relevant cultivars that were resistant to brown rot (Monilinia fructicola) fungus and many that were grown were highly susceptible to bacterial spot (Xanthomonas arboricola pv. prunorum) disease. I watched as the acreage planted to bacterial-spot-susceptible cultivars bred in California was increasing rapidly, the incidence of bacterial spot disease was increasing, and the grower “spray bill” to combat this disease was skyrocketing.

To complicate matters further, based on conversations with Clemson University’s Dr. Guido Schnabel it appeared that peach brown rot management was becoming increasingly more difficult because of rising resistance in the brown rot fungus to different and important classes of fungicides.

Finding A Solution In Genes
So what are public fruit breeders at the Land-Grant universities and USDA-ARS doing to help? One powerful solution is genetic, minimizing the need for sprays, dips and other cultural management practices to ward off infection.

With all of the modern DNA-based tools and techniques and access to disease-resistant germplasm from the centers of origin of these crops, do breeders have all the tools needed in their toolboxes to miraculously provide growers with the new “bullet proof” apple, pear, cherry, or peach cultivars with superior productivity and fruit quality?

The obvious answer is no. Although the potential return on investment is huge, breeding programs are typically long-term, diverse and complex, labor-intensive, and expensive to run. Relying only on performance results of the parents, the odds are against any single cross providing an eventual superior new release.

Federally funded efforts such as the 2009-2014 USDA-National Institute of Food and Agriculture (NIFA) Specialty Crop Research Initiative, RosBREED (RosBREED.org) project, have brought together conventional breeders, allied scientists, Extension professionals, students, and industry stakeholders to develop and use genetic markers for economically important attributes. This allows the breeding programs to make more creative, accurate, and efficient progress in their efforts to provide sustained genetic solutions to industry challenges and consumer demands. In contrast to the past when many breeding programs were more independent of each other and there was limited sharing of resources and technology, now there is a strong community of faculty, students and stakeholders working together on opportunities and talking with each other about future ideas and goals.

With An Eye To The Future
An ambitious goal being discussed now is the combination in new cultivars of both disease resistance (to multiple critical threats) and superior fruit quality. To date, this grand union has been unattainable by fruit breeders. But strong momentum in collaboration, resources, tools, knowledge, and scientific understanding may make this a viable outcome in the near future.

So you might ask, what can I do to help? For one, you can intentionally interact with breeders and Extension faculty to let them know about your issues, concerns, and problems. You can volunteer to participate as part of a breeding program advisory committee. You can attend summer field days (or other times of the year) when fruit of superior selections are made available for tasting and evaluating and you can provide input.

In some cases, you may be able to participate with breeders to host a trial site on your farm where advanced selections can be compared with industry standard cultivars. Further, you can communicate with university and government officials to thank them for supporting fruit breeding programs and specialty crop research (e.g., the recently signed 2014 Farm Bill) and be a willing industry stakeholder partner for future grant-funded projects in your region.