GROWING KNOWLEDGE

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A focus on function

BY RYAN CONTRERAS

IF THIS ARTICLE sounds familiar, perhaps you read one similar in tone in a recent issue of *Greenhouse Grower* that was written by Allan Armitage.

Dr. A made a plea to breeders to do a better job of breeding plants with an explicit purpose. He also asked them to follow up by telling the rest of the industry, so they in turn can spread the gospel to the gardening public.

He's right. Breeders should be more active in getting the word out that we're not just breeding pretty plants. Dr. A made the point that new is not always better and, in fact, there is a widening gap between what is new and what works.

Heeding his call, I'm going to tell you about some functional woody plants that we are working on at Oregon State University.

Figure 1. 'Oregon Snowflake' flowering currant during early summer. Its dense habit and improved branching do not require regular pruning, as other cultivars do.

Compact, cut-leaf currants

Flowering currant (*Ribes sanguineum*) is a native of the Pacific Northwest. Cultivars primarily have been selected for increased flower production or intensity of colors. The species is well adapted to gardens but also has good drought tolerance once established.

However, I do not consider any of previous cultivars to be great "garden plants" since they often are too leggy and hold little interest after flowers or fruits are gone.

The introduction of 'Oregon Snowflake' (Contreras and Friddle, 2015) was a marked improvement for the species. It is a more compact, semi-dwarf selection with deeply dissected leaves. Its improved form does not require constant pruning, as with other cultivars (Figure 1). Furthermore, the distinct leaf shape provides summer interest, long after I would have ripped out 'King Edward VII' or 'Ubric' (White Icicle™).

Currently we are developing the next generation, including pink and red flowering forms. These potential selections (Figure 2) are a result of crosses between 'Oregon Snowflake' with pink and red flowering cultivars. They share the deeply dissected leaves and compact habit of 'Oregon Snowflake' but will provide consumers with a variety of flower colors from which to choose.

In short, these new selections work for a variety of reasons. They require low water use, they are attractive to pollinators, they have an improved growth form that requires less pruning, and they have an additional season of ornamental interest.

Drought-tolerant and fire blight-resistant cotoneasters

Some of you may not consider cotoneasters to be "plants with style." But if we are talking about plants that function well in modern, low-input landscapes, then they should be part of the discussion due to their excellent drought tolerance and ability to withstand the heat islands of parking lots where they often are planted.

To date, our breeding program has focused on fire blight resistance as a main goal. Many cultivars are susceptible and in high-pressure areas like the southeastern U.S., they simply are not viable.

We have demonstrated that there are excellent sources of fire blight resistance (Rothleutner et al., 2014), which we have subsequently used in combination

with the commonly grown cultivar 'Coral Beauty' (Contreras et al., 2015).

We have confirmed that our hybrids are resistant ***to a particular pathotype under glasshouse conditions***. I emphasize this caveat because we are currently conducting the next phase of research, which is to confirm that our selections are resistant under production and landscape conditions to an array of pathotypes in multiple environments.

To test this, we are collaborating with several nurseries as well as university cooperators at Kansas State, Virginia Tech and UC-Davis to field test these plants. The UC-Davis trials are of particular interest, as our plants will be evaluated as part of the UC-Davis Irrigation Field Trials for Landscape Plants (**http://ccuh.ucdavis.edu/Resources/plant-trials**) beginning in 2017.

Participating in this trial will allow us to achieve two major goals: 1) to quantify the level of drought tolerance, and 2) to evaluate the fire blight resistance of our cultivars to a pathotype of the bacteria isolated locally, which is different from our previous evaluations.

Drought tolerance is a trait that may seem obvious to evaluate: if you do not water a plant, does it survive or not? However, it is much more nuanced and complicated than that.

For instance, are we referring to drought tolerance in the Willamette Valley, where we may not get any rain each summer but generally have milder temperatures? Or are we referring to drought tolerance in Tifton, Georgia, where a good portion of the year is spent above 90 degrees and plants are growing in sandy soils?

The point is that, often we, as an industry, have not done a great job of quantifying drought tolerance, largely because it's difficult and heavily impacted by so many factors. The UC-Davis trials will effectively quantify the level of drought tolerance of OSU selections alongside industry standards commonly grown in California nurseries by varying irrigation levels and assessing plant quality.

As a result, we will be better able to describe to growers, landscapers and the general public exactly what we mean by drought-tolerant cotoneasters. We will record good information on fire blight resistance to at least one additional pathotype under field conditions, as well as specifics regarding how much irrigation is required to maintain high-quality plants in the landscape.

Figure 2. A sampling of a population of progeny from crossing 'Oregon Snowflake' with pink and red flowering cultivars. There is substantial variation in leaf morphology and degree of dwarfing from which to select future releases.

Sterile maples

Some plants, such as cotoneasters, are naturally tolerant to stress but have other issues that need improvement through controlled breeding. In the case of cotoneasters, they are drought tolerant but need improvement for form and disease resistance.

Other plants, such as Norway maple and Amur maple, are extremely hardy and tolerant of urban conditions but are weedy and have lost favor because they have escaped cultivation.

In 2011 and 2012, we developed tetraploids of both maple species. We interplanted them with diploids and allowed them to open-pollinate in hopes of recovering sterile triploids.

These plants flowered in 2016. Currently we are growing more than 400 plants to be screened for ploidy level »

Figure 3. Population of several hundred Amur maples that potentially are triploid.

(Figure 3). After confirming which plants are triploids, we will begin the process of testing these plants for performance and sterility prior to release.

Already, these plants are creating quite a lot of excitement due to their wide variety of leaf shapes, intense color of new growth, and even alternately arranged leaf phyllotaxy, which I must say was new to me in maples.

There is much work remaining on developing better maples. Sterility in these tough trees would be a major step forward, but also we are looking for increased resistance to powdery mildew and seeking reliable resistance for *Verticillium*.

In Norway maples, many of our tetraploids derived from green leaf cultivars. For example, 'Emerald Queen' has moderate-good resistance to powdery mildew. None of the red leaf selections derived from 'Crimson King' appeared to be resistant. Nevertheless, we are moving ahead with larger populations with the goal of improving resistance in both green and red leaf selections that are sterile.

Breeding with intent

Dr. Armitage reminded us to be ever vigilant and to breed for plants that solve a problem in shrinking landscapes. If it does not "do something," Millennials likely will pass it by.

Breeders like myself tend to get way more excited about fragrance, flowers, fruit and other fun traits with a "wow factor." But more and more I hear increasing demand from all ages for plants that are drought tolerant, disease resistant, ornamental, non-weedy, and so forth. Virtually every project we undertake has the goal to solve such problems.

Our work with flowering currants, cotoneasters and maples is just the start. We are also making similar efforts in mockoranges, lilacs, cherrylaurels and box huckleberries.

Ryan N. Contreras, Ph.D., is an associate professor of ornamental plant breeding in the Department of Horticulture at Oregon State University. He can be reached at ryan.contreras@oregonstate.edu.

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