

Oregon Department of Agriculture and Oregon Association of Nurseries
Nursery Research Grant Proposal 2025

DATE: July 22, 2024

TITLE: Developing sterile forms of economically important nursery crops

Ryan Contreras

4017 Ag. and Life Sciences Bldg.

Professor & Associate Head

Corvallis, OR 97331-7304

Department of Horticulture

Voice: 541-737-5462

Oregon State University

ryan.contreras@oregonstate.edu

<https://horticulture.oregonstate.edu/users/ryan-contreras>

BACKGROUND:

Many nursery crops on which growers and landscapers rely have spread from cultivation by seed and in some cases become invasive to the point of regulation. These often are important crops such as maples, cherrylaurels, and barberries that can make up large portions of growers' sales. As such, these crops can impact our state's whole industry. We have been developing seedless forms of maples, althea (*Hibiscus syriacus*), cherrylaurels, japanese barberry (*Berberis thunbergii*) and japanese spirea (*Spiraea japonica*) with considerable progress on all.

Maples. Oregon is the leading producer of shade trees for the US and maples are among the highest selling. However, several maple species have are considered invasive and some have been banned including amur and Norway maples. Other economically important maple species also produce copious amounts of seed, such as trident maple and hedge maple. These species are not yet regulated but the potential remains unless sterile forms can be identified. I propose that development of sterile forms prior to regulation by government agencies will allow producers to continue to grow and market each of these species.

Norway maple. Due to the prevalence of verticillium at the Lewis Brown Farm, I have been planting tetraploids and triploids at the Smith Hort Farm (aka Veg Farm) where pressure appears to be low. Previously planted tetraploids have been growing since 2016 and most show little pressure. I secured additional funding through another source and worked toward optimizing micropropagation of Norway maple to expedite deploying triploids to the industry as well as providing a means to propagate on own roots to re-introduce to previously banned regions. We began testing plants from TC in 2022. During 2023 and 2024 we distributed one triploid accession (97.02) to nursery and research collaborators in Illinois, Iowa, Minnesota, Ohio, and Oregon and it was also established in a replicated trial in Corvallis. Meanwhile, we continue to collect more seed to generate additional triploids for future development. All new triploids of susceptible species (Norway and Amur) will be first planted at the Smith Farm for initial trials and propagation before testing for disease resistance.

Amur maple. During 2018, we field planted 157 confirmed triploids of Amur maple and between 2018-2024 we observed several hundred flowering events (a tree flowering during one year is a flowering event) and none have set viable seed. We collect and sow all that hangs on the trees but clearly none is viable. **Our observations are essentially 100% reduction in fecundity among our triploids.** One genotype (118.14) of three put into TC was superior in multiplication and has been sent to cooperators in Illinois, Iowa, Minnesota, Ohio, Oregon, and Tennessee and was also planted in a replicated trial at OSU during 2024. We already have information back on plants that were grown in Minnesota that they experienced no winter damage. While that is not surprising, it is good to confirm. Ten selections were submitted to grower cooperator for

evaluation alongside NC State triploids and cultivars. In this way, we can identify the best performing triploids to support the industry. I want to emphasize, we are not “fighting it out” – we want to facilitate getting good plants to industry

Trident maple. We have a single trident maple triploid that flowered for the first time in 2020. During 2020, a triploid trident maple flowered and had more than 25,000 seeds based on replicated 100ct weight. After stratification and sowing, we recovered six (6) seedlings. This is germination of 0.02% compared to 25.7% for diploid, which is 0.08% relative fertility or a reduction of 99.92% - these data along with the Amur maple observations provide strong evidence of reduced fertility among triploids. Additional triploids were derived from tetraploids in 2020, and field planted during September 2021. These trees have remained symptom free, whereas nearby Amur maples are highly diseased. I remain optimistic that upon flowering we may recover triploid hybrids of trident x amur maple that may be resistant to verticillium. Thus far I have seen no “winners” that have superior form.

Hedge maple. We also developed tetraploid hedge maples that were fall planted 2020 and remain disease free. On July 25, these 4x plants were observed to have heavy fruit set, so it appears likely we will have triploid hedge maples later this year. This brings us to 4 species of maples for which we are making solid progress on developing sterile triploids: *Acer buergerianum*, *A. campestre*, *A. ginnala*, and *A. platanoides*.

Our goals for maples are 1) to continue developing more triploids from which superior clones may be selected that exhibit various trait combinations such as leaf colors (new growth, growing season, fall color), growth forms (fastigate, standard, columnar, etc.), and Verticillium resistance; 2) continue testing fertility of our triploids including through more recent plantings at the Smith Hort Farm and via cooperators nationally to help re-introduce to historic markets; 3) continue working with growers to move forward selections we have propagated via stem cuttings and TC.

Cherrylaurels. Our goals are to 1) develop sterile forms of common cherrylaurel that exhibit the typical phenotype that consumers are used to and 2) develop sterile hybrids of common cherrylaurel x Portugese cherrylaurel that exhibit shothole disease resistance that are also sterile. We have developed polyploids of both species and we had a single inflorescence from a Portugese polyploid (16x) in 2019. This plant did not flower during 2020-2022, but when it returns to flower we will begin crossing ‘Otto Luyken’ and ‘Schipkaensis’ with this polyploid. Additionally, some of our ‘Schipkaensis’ induced polyploids have been relatively free of shothole. This is interesting and perhaps promising for one aspect of the project and observations continued to be positive in 2023. During 2021, we identified novel haploids of common cherrylaurel with low chromosome numbers that may be our best chance at successful crosses. We made several hundred pollinations during 2021 using pollen from some of these plants and recovered 3 seed, but none were hybrids. However, more haploids (11x) of common cherrylaurel were identified and now have been field planted. None flowered in 2022, but in 2023 we made several hundred crosses and recovered 8 seed that may be hybrids. This work is just reaching maturity and I have great confidence I will successfully develop hybrids.

Rose-of-sharon (althea).

We have identified ploidy levels and fertility of most commercially available cultivars – the latter of which is an easy improvement observed among our selections, confirmed by testcrosses from 5x plants that exhibited a 94% reduction in fertility. In 2015 and 2016 we

developed hundreds more 5x plants. Selections from our 2017 crosses were field planted in 2020 and we have continued observations. In 2022 we released ‘ORSTHIB5x1’ Petite Pink Flamingo™. It is available for licensing on a non-exclusive basis. In 2019, we made several hundred crosses of 4x x 8x plants to generate more diversity at the 6x level – currently we are limited to ‘Azurri Satin’ and ‘Pink Giant’. These crosses led to a population of ~2,500 hexaploids that was reduced to 500 plants that were field planted during September 2021, and further reduced to ~150 during 2023 based on performance. There are several plants that have great promise as seedless cultivars that I plan to introduce. Additionally, in 2024 we will use some of these 6x plants to cross with existing cultivars to generate more 5x plants.

Barberry. Other programs including UConn and NCSU have introduced seedless barberries prior to us but considering the relative size of the market, we believe there remains opportunity. We have developed tetraploids that we have evaluated for five years flowering and obtained no seed. Additionally, we have grown out a large population of seedlings collected from 2x plants and identified one triploid – a phenomenon previously thought not possible due to the so-called triploid block. We were unsuccessful in developing new tetraploids from the improved cultivars we attempted during winter 2022. We will collect seed again to try again for 2023. The tetraploid appears to be a viable selection – it is not terribly remarkable but is a decent grower and performs on par with other standard purple-leaf cultivars in my observation. I think it warrants introduction but have yet to commit. Industry input is that we need the various novel phenotypes for it to gain market traction and that is where we are going with our work. During spring 2024, we treated seedlings derived from ‘Orange Rocket’ that are highly variable in form and color. We have yet to start screening those seedlings, but I have confidence there are tetraploids among them. Confirmation will take place by mid-August 2024.

Spiraea. I developed tetraploids of ‘Goldmound’ and ‘Little Princess’ a number of years ago and then backcrossed these to develop triploids. During 2021, we field planted these and have been making observations. We propagated 9 selections during spring June-July 2024 based on input received at our June field day and observations of seedling production during 2023. Our polyploids are planted adjacent to many excellent industry introductions that we are allowing to open-pollinate and we also have propagated them to make greenhouse controlled crosses during 2025. Hybrid triploids with novel phenotypes being the goal. Finally, following irradiation, I have identified a *S. douglasii* selection that does not sucker and flowers prolifically. This may be an option to current market trends of native plants, pollinator plants, and restoration. While this native species does not need to be seedless, it fits within the context of “ecologically friendly”.

Budget Summary

Salary	
FRA Support (6 months)	\$27,323
Other payroll expenses	\$19,159
Undergraduate students	\$7,000
Other payroll expenses	\$840
Services and Supplies	
Growing supplies, lab kits, etc.	\$5,000
Total	\$59,322