Oregon Department of Agriculture and Oregon Association of Nurseries
Nursery Research Project Proposal 2018

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TITLE: New cultivars of nursery plants with novel ornamental traits and disease resistance

Ryan Contreras
Associate Professor
Department of Horticulture
Oregon State University
4017 Ag. and Life Sciences Bldg.
Corvallis, OR 97331-7304
Voice: 541-737-5462
Email: ryan.contreras@oregonstate.edu
Web: https://horticulture.oregonstate.edu/users/ryan-contreras

BACKGROUND:

The Ornamental Plant Breeding Program at Oregon State University has grown into one of the leading university breeding programs in the US with regard to developing a scientific basis for crop improvement and contribution to the scientific knowledge base. While we have been growing the background knowledge (e.g. genome sizes, disease resistance, heritability of ornamental traits) on a multitude of crops we have simultaneously been improving many crops. We have continued to publish our findings including reporting on inheritance of flower colors in *Hibiscus syriacus* and molecular markers associated with reblooming in lilac. I have released two new cotoneaster cultivars during 2018 and 2019 that met our criteria. In order to reach greater market potential, these cultivars are being marketed by Plant Haven – a decision that was made after seeking much industry input from many conversations at-large as well as with the Ornamental Plant Breeding Crop Advisory Committee (OPCAC), which includes industry representatives (Jeff Stoven, Laurie Rogers-Roach, Mark Bigej, and Guy Meacham). In the near future there should be many more cultivars coming from the mockorange, cotoneaster, and currant projects with other genera to follow. There are seven (7) projects briefly outlined below that I am requesting funding to continue. The committee may note that there are nine (9) projects below but I will be concluding formal breeding efforts on *Ribes sanguineum*, as I think we have sufficiently met the goals of this small market plant. Likewise, we have concluded nearly all of the proposed work on *Galtonia* and have moved several selections into grower trials.

Lilacs. Growers have shared many times that they would like an alternative to Bloomerang® that grows better in production and has a more prolific second flush of flowers. We have been breeding with many related cultivars (e.g 'Miss Kim', 'Palabin', 'Josee') that are reliable growers. The hybrids we have developed show a broad range of phenotypes and many show great promise. After field observations during 2017 and 2018, we propagated six (6) selections that I think have merit for advanced evaluation. They are without disease symptoms, have strong rebloom, and are vigorous. We identified and published research involved in the first step to develop useful markers for reblooming in lilac. Control of reblooming is a two-gene model (in press with J. Amer. Soc. Hort. Sci.) and shortly we will work with Kelly Vining (bioinformatics) to transform these into markers we will use to screen future populations. 2020 will see additional populations developed to validate our markers along with more sequencing of these genotypes. Once I deploy these markers our lilac breeding will be revolutionized by streamlining. Instead of growing 500 plants and only 100 may have the genes for reblooming, we can germinate 1,000 plants and screen them such that we only grow plants with the genes. We may end up growing the same number of plants to evaluate, but we will be highly efficient – L.E.A.N. if you will.

In common lilacs, we have focused on floral traits (e.g. picotee, double, intense color), foliar traits (purple leaves from 'Old Glory'), and blight resistance (primarily from 'Old Glory'). We have 68 hybrid selections from our various crosses that have shown no symptoms of blight and have good form. We field planted those selections in 2017 – many of these remain free from *Pseudomonas* blight. Our pressure for blight is extremely high and I have conducted repeated rounds of discards as plants show symptoms. We are continuing to grow our first F_2 generation by collecting open-pollinated seed from our

first hybrid crop. Additionally, we made additional crosses with 'Sensation' in combination with 'Old Glory', 'Prairie Petite', and others in continued efforts to produce more picotee cultivars.

Cotoneasters. The study at UC Davis has shown our first release, 'Emerald Sprite' to be highly drought tolerant compared to other cultivars. This cultivar was released in 2017 and there is a US plant patent application in place. The next release was 'Emerald Beauty', which is a replacement for 'Coral Beauty' that is disease resistant and more densely branched than the industry standard. Intersubgeneric hybrids continue to be of high interest scientifically and I believe have merit for their increased hardiness and potential fire blight resistance. The first was developed in 2011 (H2011-01-002) but has not "taken hold", as industry input is that a deciduous cotoneaster is less desirable. However, this selection along with other similar hybrids we envision, have potential to be disease resistant and at least a zone or two hardier than plants 'Emerald Sprite' or 'Emerald Beauty'. I heed the guidance of industry while maintaining some efforts in this area. Regardless of parentage, fire blight will continue to be a major focus and all parents and progeny are/will be screened. One very interesting area we have pursued is determining the resistance of our cultivars (and industry standards) to a mutant isolate of fire blight that overcame the Mr5 resistance from apple, which had previous been impervious to the pathogen. 'Emerald Sprite' maintained a high degree of resistance, while 'Emerald Beauty' still outperformed 'Coral Beauty'.

Styrax japonicus. To combine the weeping habit of Marley's Pink Parasol (MPP) and Fragrant Fountains (FF) with the purple foliage of Evening Light (EL), we made crosses in 2016 and have 15 hybrids between EL and MPP as well as 8 hybrids of EL and FF. Most of these plants do not combine weeping and purple foliage, so we will continue to the F_2 generation in which 1/16 of the plants will combine those traits. Hybrids were field planted in spring 2018 and are growing well. Plants flowered in 2019, including a remarkable purple, weeping selection with pink flowers that has been propagated via stem cuttings as well as budwood being shared under an MTA with Ekstrom Nursery to assist in building numbers for testing. Much interest was shown for this plant at the 2019 field day and since by all who have seen it (Fig. 1, **LEFT**).

Cercidiphyllum japonicum. Similar to the styrax project, we are combining the weeping habit of Amazing Grace and Morioka Weeping with the red foliage of Red Fox. Additionally, we would like to select a new red foliage form that is a better performer than Red Fox, as many growers have shared that they are dropping it due to poor performance. We have 102 F_1 hybrids field planted at the Lewis Brown farm that we are evaluating. No F_1s combine the traits, so we are continuing to the F_2 generation. I have observed that this species is reticent to flower from seed. No flowering observed during 2019

Ribes sanguineum. Recently, there has been much interest in planting native plants and consumers have been demanding greater choices of native plants. Flowering currant is desirable in flower and withstands drought once established but is rangy and overall could use improvement. To address this, I released 'Oregon Snowflake', which has greatly improved form and unique foliar traits. While this

selection has yet to make a large impact on the industry, it has been licensed by Whitman Farms and Joy Creek Nursery in Oregon and PLANTIPP is the exclusive licensee in the European Union. There is agreement that the form and leaf characteristics are superior to available cultivars. To expand interest, I began working toward a series of cultivars to compliment the white flowers of 'Oregon Snowflake'. I have continued observations of plants resulting from crosses between 'Oregon Snowflake' x 'Pokey's Pink' and 'King Edward IV'. I was not satisfied with the plants in this population, as they did not combine the desired foliar and growth traits from 'Oregon Snowflake' with the pink and red flowers of the other cultivars. However, there were three selections that had improved forms and very good foliage traits that were backcrossed to 'King Edward IV'. The plant to the right is the best combination of dwarf, branching habit, dissected leaf, and pink flowers. Cutting trials will be performed in 2020, and assuming we are successful we will release and conclude the formal *Ribes* breeding project.

Galtonia candicans. Cape hyacinth is a species native to South Africa that has excellent drought tolerance and ornamental traits but has the potential to be very weedy and also gets too tall and lodges (falls over). We conducted a mutagenesis project to address these issues and we have nine (9) selections that produce little to no seed and do not lodge. These selections were field planted in 2017 for long term field evaluation. However, I have not seen any detracting traits and I consider them ready for grower trials if there is an interested party. In 2018 we identified two selections in particular that are highly floriferous, do not lodge, and produced zero seed. We lifted these selections during fall/winter 2018-19 and multiplied by conventional means. We observed some off-types in the resulting container plants (taller plants, primarily) and discarded those. We have maintained the plants in a single row at our research plots and are seeking industry partners with an interest in promoting these. However, no additional selection or actions are planned.

Philadelphus. There is great opportunity for improvement in this genus. Many available cultivars lack fragrance, are rangy, or both. We have been combining traits from taxa such as *P. madrensis* with 'Snow White', 'Blizzard', 'Miniature Snowflake', and others. Our unique combinations of fragrance, form, and leaf traits set our selections apart from what I have observed. We rooted a total of 37 selections from stem cuttings in 2017, nine of which have immediate potential as releases. We distributed 5 different selections in 2019. These have varied texture, size, and flowering characteristics. While we are maintaining our larger collection, in 2020 we are focusing our efforts on more comprehensive production evaluation of these selections.

Sarcococca confusa. Fragrant sweetbox is a great shrub with no pest and disease problems, extremely drought tolerant, and shade tolerant. Other than being slow in production, its main problem is that it has "wild" branching. We conducted mutation studies to address this and selected nine (9) clones that we propagated, later narrowing this to three. Two cultivars are highly compact and may act as a

replacement for Himalayan sweetbox without its rhizomatous nature. Greatest interest has been for one of these dwarf selections and our chartreuse selection that exhibits this trait most intensely during winter. Input from Jack Bigej indicated this could be a significant impact plant for IGC consumers. I think overall, this species is underutilized in temperate landscapes and should be promoted. We have relatively large stock of the chartreuse selection and are building numbers of the others for interested growers.

New cultivars of street trees. We need more options for street trees to replace ash and also compliment maples and other staples. To that end, we initiated a mutation breeding program in 2018. We treated thousands of seeds of the following species with a chemical mutagen to induce useful mutations: *Quercus robur*, *Phellodendron amurense, Celtis occidentalis, Celtis koraiensis,* and *Zelkova serrata.* We planted 600 trees resulting from treatment and already have identified useful mutations. It is early in the evaluation process, but it appears likely that cultivars will result. 75 trees were flagged and at the time of writing are being spaded and spaced for long term evaluation (figure on right). Of note are selections derived from fastigiate English oak that had good form (without pruning) and no powdery mildew, good forms of amur corktree (varied in size), dramatic color on hackberry, good form and color on zelkova.

Budget Summary

Salary	
Tyler Hoskins (3 months)	12,136
Other payroll expenses	$7,889
Contreras (0.5 month)	$4,625
Other payroll expenses	$1,712
Supplies and Services	
Field plot and greenhouse fees	$2,500
Supplies	$1,000
Total	**$29,862**