Oregon Department of Agriculture and Oregon Association of Nurseries

Nursery Research Project Final Report 2013

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Title: Retaining an industry-wide benefit by the OSU Ornamental Plant Breeding Program

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Background:

Currently, the majority of ornamental plant breeding programs in private industry and at public institutions are for the benefit of a singular private entity who provides the needed financial support and holds exclusive license. However, I believe efforts focused on the development of new and exciting ornamental taxa that could benefit the industry as a whole, meet regional needs and provide notoriety to the institution and industry are possible. In addition, breeding of woody ornamentals is a long and tenuous process that requires upfront resources and capital with medium and long-term outcomes and benefits. Recently an ornamental breeding program was established at Oregon State University to develop and evaluate new woody plant cultivars for production and sale by Pacific Northwest nursery industry. Meanwhile, academic institutions have reduced support for faculty members due to reductions in the amount of state and federal money received. As a result, many new faculty members in agricultural sciences are required to provide operating costs (material and supplies, institutional plot fees, greenhouse costs) and provide all or a portion of payroll (salary and benefits) for undergraduate interns, graduate students, technical assistants and themselves. This is a somewhat unique challenge to ornamental plant breeding programs since they are less competitive for Federal funding compared to other disciplines (ecology, production, pest management). This is in part to the nature of projects, which are long-term and result in a intellectual property (patents). Furthermore, nursery and landscape plant development has been conspicuously absent from USDA funded projects and the Horticulture Research Institute (HRI) recently has moved away from funding cultivar development. This lack of funding from grant sources to fund ornamental plant breeding has forced some notable ornamental breeders to expand into other areas of interest, such as biofuels, to maintain a thriving program that meets the expectations of their peers and academic institution. It is my desire for the OSU ornamental breeding program to remain focused on the evaluation and development of novel nursery crops that meet the needs of a progressive industry. It is my goal that short to medium term support will yield novel and desirable woody plants that can be patented by OSU. These releases will be available to all Oregon growers and the resulting patent can yield consistent funding to maintain the OSU Ornamental Plant Breeding Program.

Current Progress:

Since its inception in December 2009, the Ornamental Plant Breeding Program at Oregon State University has begun to address a number of breeding objectives that are key to the Oregon Nursery Industry. We are taking a broad approach and attempting to address the needs of many sectors of the industry. Our selection of projects has, and will continue to be, based on industry input. I have developed an Advisory Council made up of representatives of the diverse Oregon Nursery and Allied Industry to provide input and help direct research. For example, we have projects working on such diverse taxa as cherrylaurels, maples, flowering currant, sweetbox, lilacs, and arborvitae. Plant breeding, particularly woody plant breeding, is a long-term process that requires significant investment of time and resources; however, we have made significant progress on many of these projects in a short period of time. Below I will provide a bulleted list of some of the projects that are underway and briefly describe progress that has been made in a very short time.

Sterile maples. We have developed many polyploid maples, meaning those that have more than two sets of chromosomes. These include over 160 tetraploids (4 sets of chromosomes) of Norway maple, trident

maple, and amur maple. Approximately 15 selections of Norway maple have been propagated and are being grown to backcross and develop sterile triploids (3 sets of chromosomes).

Sterile cherrylaurels. We are using three techniques to develop improved cultivars of cherrylaurel that will have reduced fertility. We have numerous common cherrylaurel polypoids from *in vitro* treatments and we are evaluating plants that were treated with gamma radiation. These are expressing a great deal of phenotypic variation in growth form and several are showing distinct red new growth that we are excited about. Also, we are attempting to hybridize common cherrylaurel and Portugese cherrylaurel to develop shothole disease resistant and sterile cultivars. We have made over 4,500 crosses that have not yielded hybrids, therefore, we are shifting our focus to attempt ovule culture to recover hybrids.

Mutation Breeding. We are using induced, non-targeted mutation to induce variation in several crops. Among these are *Sarcococca confusa* and *Ribes sanguineum*. *Sarcococca confusa* is an attractive shrub tolerant of dry shade and has no serious pest and disease issues but there is little variation in the species. *Ribes sanguineum* is a native of the Pacific Northwest and has attractive flowers in spring, which are attractive to wildlife; however, it has a poor growth form that would be improved if dwarf selections were available. We have exposed both species to the chemical mutagen EMS to induce variation. We have recovered a variegated and dwarf forms of *S. confusa*, and cut-leaf and more compact forms of *R. sanguineum*, respectively. These are in various stages of evaluation and selection, with one selection already being distributed to nurseries for testing.

***Non-winter browning conifers*.** Oregon growers produce a significant proportion of the nation's arborvitae worth several million dollars. I believe we can further separate ourselves by introduction of truly non-winter browning forms of American arborvitae, Oriental arborvitae, and western redcedar. Previous research has shown polyploid plants of japanese-cedar to remain green during winter. In 2011-12, we developed over 300 tetraploids of these three species. Currently, these plants are being grown and evaluated for winter foliage color and we hope to expand to screening for mite resistance in 2013.

Lilacs. Currently, our major focus has been on the small-leaved species that show greatest *Pseudomonas* resistance. We have developed hybrids of 'Miss Kim', 'Palibin', and Bloomerang® that will be evaluated. In 2013, we will expand our work to include developing reblooming small-leaved cultivars as well as *Pseudomonas* resistant and compact vulgaris-types by utilizing previously identified sources of resistance.

Cotoneaster. We are developing disease resistant and sterile cotoneasters that perform well under the harshest of landscape conditions. We have identified 6 species with consistent resistance to a virulent strain of fire blight, we are screening 46 species in a non-irrigated replicated field experiment, and we have developed hybrids that show promise for disease resistance and sterility.

***Philadelphus*.** We have begun a breeding program to improve mock orange utilizing existing improved cultivars as well as unique germplasm, specifically *P. mexicana* to develop cultivars that are well-adapted and have improved growth form and fragrance. This program is in its first year.

Rose-of-sharon. *Hibiscus syriacus* is an old time garden favorite that is making a comeback. New cultivars are being released; however, there remains room for improvement through targeted breeding. A major goal remains seedlessness. US National Arboretum cultivars previously identified as sterile produce significant amounts of seed and it is unclear why. There are double-flowered forms and a range of color but we are not clear how these colors and flower forms are inherited. I am conducting simultaneous breeding and genetic studies to develop new sterile cultivars, while investigating 1) why the USNA cultivars have reverted to producing seed, 2) how are the various flower colors inherited, and 3) how is the double-flower form inherited. Answering these questions will allow for more targeted breeding work to take place in this species.

Objective:

Provide short and mid term support to the OSU plant breeding program to develop and evaluate new woody plants for the Oregon nursery industry. Newly introduced plants will be available to the Oregon industry as a whole and assist in retaining it competitive edge in the United States ornamental and landscape market. Furthermore, introduction of patented new plant varieties that will yield continued, self-sustaining funding for the OSU ornamental plant-breeding program to ensure it can thrive as "the" institutional plant-breeding program in America

Methods and timeline:
Continued research on proposed activities and accomplishments. Meet with Advisory Committee to identify ongoing needs. Industry Dissemination of ongoing progress through Ornamental Breeding Tour and field day, trade articles, Digger magazine, Farwest show presentations, and interim and final grant reports.

Budget Summary

Salary	
Principal Investigator (19% FTE)	$15,152
Other Payroll Expenses (OSU health benefits, insurance, retirement)	$4,848
Total	**$20,000**

Benefits to the Industry:
With industry support I am able to conduct research toward developing new cultivars with traits that benefit the Oregon Nursery Industry. Working together, I believe that the Oregon Nursery Industry and the Ornamental Plant Breeding Program at OSU can develop a unique relationship. Other breeding programs commonly release new varieties through exclusive licenses with major branding companies; however, I envision a relationship wherein the Industry financially supports the breeding work and all varieties are available for open license to all Oregon Growers.

Update on the program.
Funding provided through this grant were used to cover portions of my salary that freed up other sources of funding, including other ODA grants, to pay Faculty Research Assistant (Mara Friddle) and a Ph.D. student (Jason Lattier). The contribution of OAN and ODA to support my program lays a groundwork that I can use to negotiate the release of future cultivars on a non-exclusive basis. By this, I mean that because OAN/ODA has funded all or portions of a research project, the resulting cultivar(s) will not be released to the highest bidder. Rather, they will be available for all Oregon growers to become licensed growers. Detailed updates of the eight projects outlined above are included separately in the two accompanying reports (***Contreras_Cultivar_Improvements_2013_FINALReport*** & ***Contreras_Sterility_2013_FINALReport***).