Oregon Department of Agriculture and Oregon Association of Nurseries
Nursery Research Project Final Report 2013

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Title: Developing novel, disease resistant forms of nursery crops

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Background

The Ornamental Plant Breeding Program at Oregon State University takes a broad approach to cultivar development. This means that we do not focus all efforts on one or two species. We breed a wide variety of plants in an attempt to address the needs of the robust and diverse Oregon Nursery Industry. Below is a brief explanation of 5 projects we are conducting to develop new cultivars that have improved phenotypes and/or address an issue of disease or insect resistance.

Ribes sanguinuem. Flowering currant is native to the Pacific Northwest and is a favorite of proponents of native landscapes. It is attractive in spring when flowering and is a good attractant to insects. It tolerates poor soils and drought. However, flowering currant tends to be leggy and has a less than desirable form in the landscape. There are varied forms with regard to flower color and profusion but our goal is to develop a line of cultivars that are compact and exhibit the range of flower colors available from white to pink to cherry red. Furthermore, we have significant aphid pressure in our plots and observed significant variation in the amount of damage between plants. Therefore, we will use aphid tolerance/resistance as a secondary selection criterion.

Sarcococca confusa. Fragrant sweetbox is a shrub prized for its ability to thrive in dry shade, an exposure most plants will not tolerate. It has few pest and disease problems, boxwood blight being the exception, and requires little maintenance in the landscape. Fragrant sweetbox also produces white flowers during winter and glossy black fruit later in the year that are persistent. It is more fragrant than *S. hookeriana* and more cold tolerant than *S. ruscifolia* (Dirr, 2009). Fragrant sweetbox also does not spread by rhizomes, therefore it will not spread into unwanted areas of the home garden and can be maintained more easily. The major breeding opportunity for fragrant sweetbox is the lack of diversity in this species. Dirr (2009) reported that it reproduces true from seed, with seedlings being identical to the mother plant. This lack of diversity may be due to apomixis, which has been identified in the genus. We have initiated a mutation breeding program to induce variation. A particular goal is to identify more compact forms that would serve as an intermediate between *S. confusa* and *S. hookeriana* var. *humilis* but would not spread as in the case of the latter.

Lilacs. Lilacs are historic plants in our landscapes and remain popular today. Lilacs, particularly common lilacs (*Syringa vulgaris*; Series *Syringa*), are prized shrubs and small trees for their prolific production of fragrant flowers. Unfortunately, common lilac is particularly susceptible to bacterial blight caused by *Pseudomonas syringae* but other species such as *Syringa meyeri* and *S. patula* in Series Pubescentes often exhibit better resistance. Bacterial blight is the most severe disease on common lilac in the Pacific

Northwest; however, other regions of the country have myriad diseases in addition to bacterial blight that impact growing common lilac including powdery mildew caused by *Microsphaera syringae* and alternaria blight caused by *Alternaria alternata*. Previous research has identified cultivars of common lilac that exhibit resistance to each of these including 6 cultivars resistant to bacterial blight, 13 cultivars resistant to powdery mildew, and 2 cultivars resistant to alternaria blight; however, these cultivars are not common in the trade. Another issue for many cultivars of common lilac is that they are too large for the shrinking modern landscapes. This is another advantage that some small leaved lilacs exhibit along with disease resistance. Recent releases such as Bloomerang® that rebloom have had a major impact on the market. I envision several opportunities for improvement in lilacs including developing compact common lilacs with improved disease resistance and developing additional cultivars of the small-leaved species in Series Pubescentes that rebloom.

Project Objectives

The overall objective of the cultivar development portion of my program is to produce new cultivars for the Oregon Nursery Industry that are well-adapted, have unique phenotypes, are amenable to propagation and production, and fit into modern landscapes.

Methods and Time Line

Ribes sanguineum. Seed were treated in late-2011 with ethyl methanesulfonate (EMS) and have been growing since then. We have selected several forms that have potential for release including a cut-leaf form that has been distributed to 5 Oregon nurseries for trialing. In 2013 we will collect seed from our first generation from mutation population (M1) plants to grow out the second generation (M2). We have begun selecting the most highly branched and compact plants from the M1 and will continue in the M2.

Sarcococca confusa. This project has the same time line and methods as the *Ribes sanguineum* project. Seed were treated at the same time and our plants have set flower buds that will open in winter 2012-13. Fruit will be collected and the most compact plants from M1 and M2 generations will be propagated and evaluated.

Lilacs. We have collected 5 cultivars of common lilac that are reported to have superior resistance to bacterial blight (*Pseudomonas*). In 2013, we will begin hybridizing these with more compact varieties that lack disease resistance. We will discard plants that grow beyond a threshold height (shortest 5-10% of population) and then subsequently evaluate for disease resistance. In Series Pubescentes, the small-leaved lilacs, we have been hybridizing several superior cultivars. In 2012, we made several hundred crosses between 'Miss Kim', 'Palibin', and Bloomerang®. These crosses have set copious seed that we are in the process of harvesting and stratifying. We will grow and begin these evaluations in 2013.

Budget Summary

Salary

Faculty Research Assistant (17% FTE)	$6,135
Other Payroll Expenses (OPE)	$3,865
(OSU health benefits, insurance, retirement)	
Total	**$10,000**

Benefit to Nursery Industry

New cultivars create excitement among consumers. The Ornamental Plant Breeding Program at OSU is attempting to support the diversity of the industry by breeding varied crops that fill as many niches as

possible. The goal of the program is to utilize industry funding to develop superior new cultivars that can then be licensed to all Oregon growers wishing to produce them.

UPDATE ON THE PROGRAM

Ribes sanguineum*:* We have continued evaluation of the cut-leaf form mentioned above and it has continued to perform well. It has continued to exhibit a more mounding habit than other flowering currants and we have distributed plants to an additional 3 nurseries for a total of 8 nurseries now evaluating this selection. Summer 2013 I received word that at least one nursery would like to move forward with production. We have given permission to begin propagating larger numbers while additional data to support release and patenting are generated. I expect to submit this selection to the Variety Release Committee for the College of Agricultural Sciences at OSU in 2014 or early 2015.

Over 200 M1 plants were field planted in a randomized complete block design in spring 2013. These plants will be evaluated for at least two years. In included the cultivars 'Pulborough Scarlet', 'King Edward VII', 'Pokey's Pink', and 'White Icicle' to determine how our selections (including the cut-leaf selection) perform against industry standards. This will also speed the process of data collection for release. Data collected thus far include canopy volume at planting and at the end of the season, which we will use to calculate growth index and look for differences between treatments.

These plants flowered profusely in 2013; however, they did not set sufficient fruit to collect seed for the M2 generation. It is possible that they were not in a location that allowed pollinators access to flowers. I believe that being field planted will provide a better opportunity for pollinator activity and will result in better fruit set in 2014, at which time I will collect the next generation of seed.

Sarcococca confusa: As stated above, this project is similar to the flower currant project but there are some distinct differences that occurred during 2013. We field planted nearly 300 M1 plants in spring 2013 under 37% shade and collected growth data including height and size index. As rate and duration of treatment increased, there was a reduction in plant height and size index (Figure 1). I expect that this trend will be more exaggerated in the second generation from mutation, when segregation for recessive mutations are observed. Prior to planting, while plants were still in containers, we identified a number of genotypes that were more compact and had superior form overall (Figure 2). In addition, there was substantial variation among treated forms for leaf shape (Figure 3). A subset of the M1 generation flowered in 2012 and produced fruit that we harvested and sowed in 2012. The resulting plants from the M2 generation will be grown in containers during the 2014 growing season to evaluate how quickly they fill #3 containers and then field planted during fall 2014.

Syringa: We continued to make crosses among the small leaf lilacs in Series *Pubescentes* that include 'Miss Kim', 'Bloomerang', and 'Palibin'. Seedlings from 2012 are continuing to grow but have progressed slower than hoped. Therefore, we made additional crosses in 2013 to ensure we have a population large enough to evaluate and give the best chance of selecting a superior cultivar. I expect to move these seedlings into #3 in 2014 and field plant them in 2015. Additionally, we made crosses among common lilac cultivars and intersectional crosses between the small leaf species and common lilac (Table 1). All seed collected from the intersectional crosses has been placed in tissue culture in an attempt to recover the first intersectional hybrids between these taxa. Other seed (intrasectional) was collected and is being stratified.

Table 1. Lilac crosses performed in 2013.

Crosses	Date Pollinated	# Flowers Pollinated	# Fruits[z]
Intersectionals			
Bloomerang x Ludwig Spaeth	4/14/13	2092	31
Ludwig Spaeth x Bloomerang	4/15/13	2206	27
oblata x Bloomerang	4/10/13	547	238[y]
Josee x oblata	4/17/13	138	60
Miss Kim x oblata	4/22/13	223	0
Palabin x oblata	4/20/13	179	10
Miss Kim x President Grevy	4/22/13	408	0
Palabin x Angel White	4/20/13	91	0
Palabin x Sensation	4/20/13	197	55
Series *Pubescentes*			
Palabin x Tinkerbelle	4/20/13	206	83
Tinkerbelle x Palabin	4/20/13	253	64
Josee x Bloomerang	4/17/13	246	67
Josee x Tinkerbelle	4/17/13	145	31
Josee x Palabin	4/18/13	122	38
Palabin x Josee	4/20/13	355	38
Palabin x Bloomerang	4/20/13	239	144
Miss Kim x Bloomerang	4/22/13	380	56
Miss Kim x Palabin	4/22/13	601	417
Miss Kim x Josee	4/22/13	210	0
Series *Syringa*			
Ludwig Spaeth x Angel White	4/17/13	273	182
Angel White x Ludwig Spaeth	4/17/13	386	163
President Grevy x Sensation	4/19/13	129	40
Sensation x President Grevy	4/21/13	147	2
TOTAL		**9773**	**1746**

[z]Fruit number as of 6 March 2013.

[y]All fruit aborted prior to initiation of embryo culture experiments.

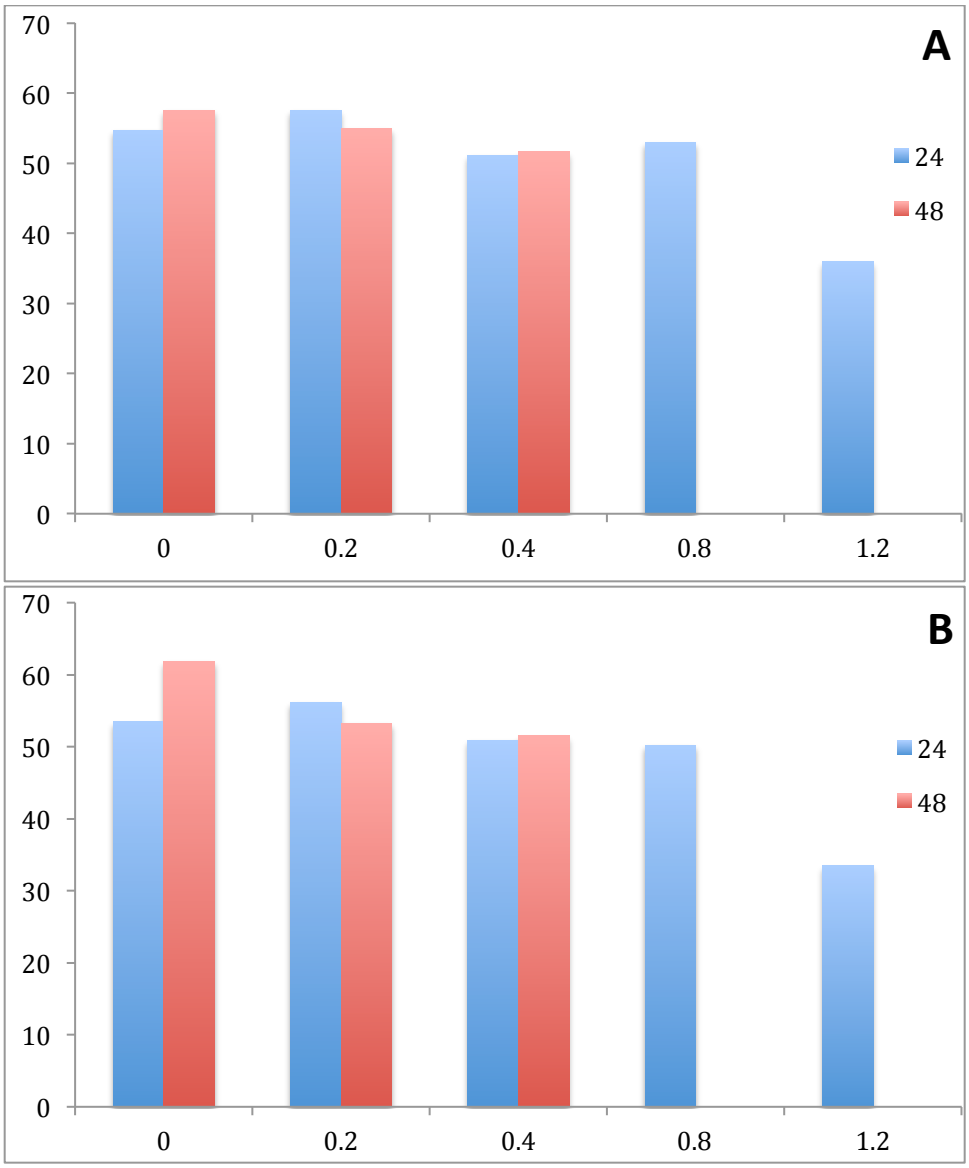

Figure 1. Height (A) and size index (B) in cm of *Sarcococca confusa* plants in the first mutation generation following treatment with varying concentrations (%) EMS (ethyl methane sulfonate) for 24- or 48-hours. Size index was calculated as $(h \times w1 \times w2)^{1/3}$.

Figure 2. Untreated *Sarcococca confusa* plant (left) and a plant treated with 0.2% EMS for 24-h (right).

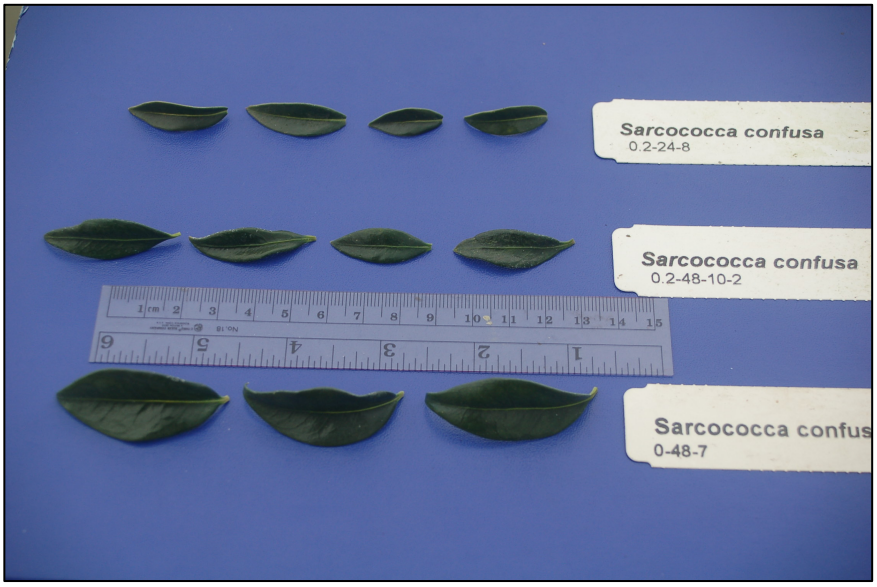

Figure 3. *Sarcococca confusa* leaves collected from untreated control plant (bottom) and leaves collected two plants treated with 0.2% EMS for 24 and 48-h, respectively (middle and top).