Progress in Breeding Non-Invasive Nursery Crops

Thomas Ranney[1], Darren Touchell[1], Richard Olsen[2], Tom Eaker[1], Nathan Lynch[1] and Joel Mowrey[1]
[1]North Carolina State University, Dept. of Horticultural Science, Mountain Horticultural Crops Research and Extension Center, Fletcher, NC 28732
[2]U.S. National Arboretum, 3501 New York Ave., NE, Washington, DC 20002
tom_ranney@ncsu.edu

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Significance to Industry: Invasive species are an important issue for the nursery industry. The problem, briefly, is that some non-native landscape plants are weedy to the point of being invasive, i.e., they naturalize over large areas, displace native plants, disrupt natural ecosystems, and compromise biodiversity (7, 9). It is often stated that invasive species represent a principal threat to biodiversity second only to that of habitat loss (10). It has also been estimated that approximately 85% of the invasive plant species in the United States were introduced for either ornamental or landscape use (8). Privets (*Ligustrum spp.*) are good examples – it is estimated that *L. sinense* alone has displaced the native shrub layer in 2.4 million acres throughout the Southern United States (6). However, privet is an important and valuable nursery crop with approximately 2.7 million new plants sold per year (http://www.nass.usda.gov/census/census97/horticulture/table13.pdf) at an estimated retail value of $32 million dollars. Considering that many of these plants are economically, aesthetically, and environmentally important, development of seedless/noninvasive cultivars is an ideal solution whereby these valuable plants can be utilized without detriment.

Nature of Work: There are a number of approaches for developing seedless plants, but one of the most efficient and effective ways is to develop triploids - plants with an extra set of chromosomes. Although triploids typically grow and function normally, they have an inherent reproductive barrier in that the 3 sets of chromosomes cannot be divided evenly during meiosis yielding unequal segregation of the chromosomes (aneuploids) or complete meiotic failure. Triploids have been developed for many crops including seedless bananas (*Musa* spp.), watermelons (*Citrullus lanatus*), grapes (*Vitis* spp.) and althea (*Hibiscus syriacus*) (2,3,4,5). Natural polyploids frequently occur in nature (1). Triploids can also occur naturally or can be bred by hybridizing a tetraploid (4x) with a diploid (2x) to create seedless triploids (3x). Triploids are not always completely seedless. However, even in the unusual case when a triploid plant can produce seeds (e.g. apples), it happens infrequently, and seedlings generally have poor viability.

Results and Discussion: We are currently working on developing non-invasive triploids of the following: *Acer tartaricum* L. subsp. *ginnala* (Maxim.) Wesm. (amur maple), *Acer platanoides* L. (Norway maple), *Albizia julibrissin* Durazz. (silk-tree or mimosa), *Berberis* spp. (barberry), *Campsis* × *tagliabuana* (Vis.) Rehd.(trumpet vine), *Cytissus scoparius* (L.) Link (Scot's broom), *Euonymus alatus* (Thunb.) Sieb. (burning bush), *Elaeagnus* L. spp. (elaeagnus), *Hedera*

helix L. (English ivy), *Hypericum androsaemum* L. (tutsan St. Johnswort), *Koelreutaria paniculata* Laxm.(panicled goldenraintree), *Ligustrum* spp. (privet), *Miscanthus sinensis* Anderss. (maiden grass), *Pyrus calleryana* Decne.(callery pear) and *Ulmus parvifolia* Jacq. (lacebark elm). We have identified tetraploids of all of these species and have successfully developed triploids of *Pyrus*, *Hypericum*, *Ligustrum*, and *Campsis*. Because this approach involves controlled breeding, it also provides additional opportunities for plant improvement. In addition to breeding for seedlessness, we are simultaneously working on enhancing pest resistance, environmental adaptability, and further commercial potential of these crops. This project will ultimately provide new environmentally-friendly cultivars that will benefit the nursery industry, our environment, and consumers.

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