DEVELOPING NEW, NON-INVASIVE NURSERY CROPS

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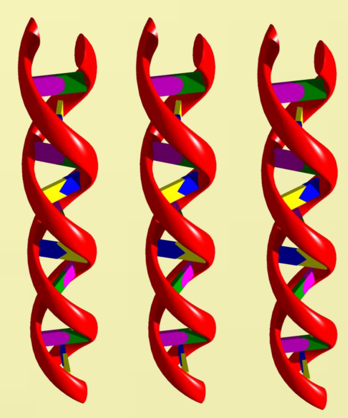
Background:

Invasive plants are an important issue for the nursery industry. Although the vast majority of plants sold by the nursery industry are not invasive, some of these economically important crops can be weedy and naturalize to the point where they can cause environmental harm. 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 grown and utilized without detriment.

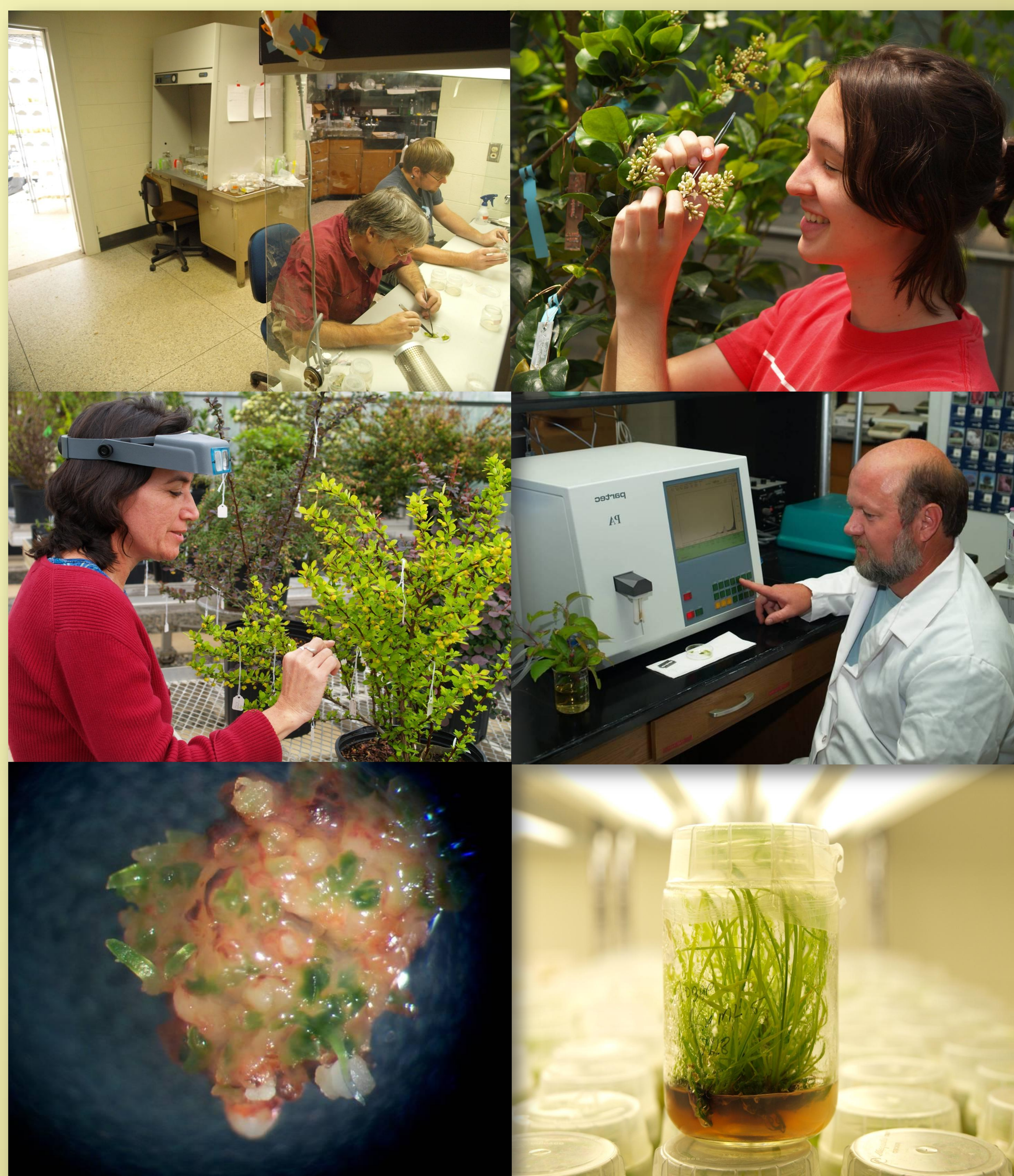
There are a number of approaches that can be used to develop seedless cultivars. One of the most effective means for developing seedless plants is to create triploids - plants with three complete sets of chromosomes. Although triploids typically grow and function normally, they have an inherent reproductive barrier in that the three sets of chromosomes cannot be divided evenly during meiosis yielding unequal chromosome segregation (aneuploids) or complete meiotic failure. Triploids have been developed for many crops including seedless bananas, seedless watermelons, grapes, and althea. Natural polyploids frequently occur in nature. Triploids can also occur naturally or can be bred by hybridizing tetraploids with diploids to create seedless triploids. Additional attributes of triploids include enhanced flowering and re-blooming, reduced fruit litter, and reduced pollen allergens.



Goals and Objectives:

The overall goal of this work is to develop seedless cultivars of invasive or potentially invasive nursery crops and to further improve pest resistance, adaptability, and commercial potential of these crops. These efforts included the development of new technologies and methods to better achieve these goals. Specific objectives include:

- Further develop and improve methods and technologies for the induction of polyploids using mitotic inhibitors and tissue culture techniques.
- Identify/induce polyploids of key taxa.
- Develop triploid cultivars through controlled crosses between tetraploid and diploid parents including the development and use of embryo culture techniques.
- Develop new technologies and procedures for developing triploids through somatic embryogenesis from endosperm tissue.
- Evaluate fertility and commercial merit of resulting progeny.
- Make new non-invasive cultivars available to the nursery industry.



Accomplishments:

We have initiated work on developing a broad range of new seedless cultivars of important nursery crops with improved commercial traits. We have successfully developed new triploid forms of *Campsis* sp. (trumpet vine), *Elaeagnus* spp. (elaeagnus), *Euonymus alatus* (winged euonymus), *Hypericum androsaemum* (tutsan St. Johnswort), *Ligustrum* spp. (privet), *Miscanthus* spp. (maiden grass), *Pyrus calleryana* (callery pear), and *Spiraea japonica* (Japanese spiraea). These plants are currently being evaluated for commercial merit and fertility. Additional efforts are underway and have been successful in developing tetraploids of *Acer tartaricum* subsp. *ginnala* (amur maple), *Albizia julibrissin* (mimosa), *Berberis thunbergii* (Japanese barberry), *Cytisus spp.* (Scotch broom) *Koelreuteria paniculata* (goldenraintree), and *Ulmus parvifolia* (lacebark elm). Once these plants reach reproductive age, we will complete interploid crosses to develop triploids. We have initiated *Acer platanoides* (Norway maple) in tissue culture and expect to have tetraploids shortly.

Technology Transfer/Impact:

We have successfully developed methods and technology for manipulating ploidy levels of important nursery crops. These methods include techniques for somatic embryogeneis, in vitro and ex vitro chromosome doubling, endosperm culture, and embryo culture to facilitate the development of triploids. We expect to begin introducing new, seedless cultivars starting in 2010.

Selected publications

- Ranney, T.G. 2006. Polyploidy: From evolution to new plant development. Proceedings, International Plant Propagators' Society: 56:137-142.
- Ranney, T.G., D. Touchell, R. Olsen, T. Eaker, N. Lynch, and J. Mowrey. 2006. Progress in breeding non-invasive nursery crops. Pro. SNA Res. Conf., 51st Annu. Rpt.
- Olsen, R.T., T.G. Ranney, and D.J. Werner. 2006. Fertility and inheritance of variegated and purple foliage across a polyploid series in *Hypericum androsaemum* L. J. Amer. Soc. Hort. Sci. 131(6):725-730.
- Ranney, T.G., D.H. Touchell, T.A. Eaker, N.P. Lynch, J.A. Mowrey, and J.C. Smith. 2007. Breeding non-invasive nursery crops. Proceedings International Plant Propagators' Society. 57: 643-645.
- Ranney, T.G., T.A. Eaker, and Joel A. Mowrey. 2007. Assessing fertility among cultivars of winged euonymus. Proc. SNA Res Conf., 52nd Annu. Rpt. 52: 352-354.
- Jones, J.R., T.G. Ranney, and T.A. Eaker. 2008. A novel method for inducing polyploidy in *Rhododendron* seedlings. J. Amer. Rhododendron Soc. 62(3): 130-135.
- Touchell, D., J. Smith, and T.G. Ranney. 2008. Novel applications of plant tissue culture. Proceedings International Plant Propagators' Society. 58: 196-199.

Triploid pears

Golden-leaved, triploid spiraea

Multicolored, triploid, hypericum

Triploid miscanthus

Triploid elaeagnus

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