The Use of Tissue Culture to Clonally Propagate New Woody Plant Selections

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Nature of Work: There is a tremendous demand for new plants. The development of novel and attractive varieties possessing new traits (whether they be altered flowering or form, foliage, color, or improved agronomic performance) are a boom to the Georgia and national nursery industries. However, problematic with woody plant breeding programs is their long generation time. Crosses or selections must attain size and reproductive maturity before they can be evaluated. Once identified as promising, propagation of selections is inhibited by limited plant material. Several seasons may be required to propagate sufficient material for evaluation. If found worthy of release, a further impediment to commercialization is insufficient stock for propagating plants to meet market demands.

New plant introduction and release to the industry can be greatly accelerated by using plant tissue culture to clonally propagate promising new plants. The objective of this project is to use tissue culture to propagate woody plant selections in collaboration with the Plant Introduction Program of Dr. Michael Dirr. This technology will facilitate plant evaluation and produce plant material so that new introductions can be more rapidly released to the industry.

Plants that were placed into tissue culture included several hydrangea (*Hydrangea macrophylla, H. arborescens, and H. quercifolia*) and crape myrtle (*Lagerstroemia indica*) selections. Tissues were placed into culture media to promote shoot proliferation. Stages in growing shoot multiplication cultures consisted of 1) the disinfection and establishment of cultures, 2) shoot multiplication, 3) rooting, and 4) acclimatization.

Results and Discussion: The disinfection of tissues to eliminate fungal and bacterial contaminants was often a difficult challenge. Tissues exhibited high rates of contamination. This often required micro-dissection of buds and shoot tips for use as starting tissue, multiple resterilizations of cultures, and incorporation of antibiotics into the media. However once clean cultures were obtained, protocols were developed from culture media optimization studies that allowed rapid rates of shoot multiplication via axillary bud proliferation. Parameters that were adjusted included the inorganic salts (macro and micro nutrients), plant growth regulator concentrations, organic components (vitamins, amino acids, carbohydrates), and subculture frequency. Each of the selections differed in their culture medium requirements. For example with crape myrtle, shoot proliferation and elongation varied markedly with each selection. Adjustments in plant growth regulator concentrations were required to obtain shoots suitable for rooting. Regenerated shoots were either rooted *in vitro* on media with auxins (crape myrtle) or rooted *ex vitro* in the greenhouse under mist (H. arborescens, and H. quercifolia). Plants transferred to soil were acclimatized under mist and shade in the greenhouse. Plants regenerated from culture had high survival rates and exhibit uniform morphology and growth.

Tissue culture protocols were successfully developed for a number of new woody plant selections. Over 5,000 crape myrtle plants have been regenerated from culture (1,000+ plants for each of 4 selections and 200 to 500 plants for 2 others). Over 2,000 *H. quercifolia* and 500 *H. arborescens* plants have been produced in culture.

Significance to the industry: New plants are a driving force to the ornamental industry, and there is a high demand for novel plant introductions. Use of tissue culture for the micropropagation of promising selections aids in the evaluation of new genotypes, and accelerates the release of new plants to the industry.