

Tissue Culture, Vegetative Propagation, and Genetic Modification Technologies of Hardwood Tree Species

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Cooperators:

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Graduate Students and Post-docs:

Current:

Y. Wang, Fall 2009, van Eck Scholar

Previous:

A.C. Espinosa, M.S., 2004
G. Smagh, M.S., 2005
C. Roschke, M.S.-non-thesis, 2007
G. Vengadesan, Post-doc, 2007
X. Liu, Ph.D., 2008
N. Du, Ph.D., van Eck scholar, 2008

Laboratory Technician:

Rochelle Beasley

Undergraduate Researcher:

Kaitlin Palla, HLA

Goals:

1. Tissue Culture: Develop in vitro selection, somatic embryogenesis, micropropagation, organogenesis, rooting, and clonal propagation technologies for fine hardwood tree species.
2. Vegetative Propagation: Develop rooted cutting propagation technologies for fine hardwood tree

Statement of Problem:

Clonal reproduction of commercially important hardwood tree species is necessary, in a tree improvement program, in order to provide improved planting stock for use in progeny testing and for production forestry. In vitro and vegetative propagation methods will be required to produce clones of elite genotypes or genetically improved genotypes. Many ecologically and economically important hardwood tree species have a low genetic or physiological capacity for adventitious root formation, and are considered recalcitrant to routine, commercial-scale propagation. Genetic modification of hardwood tree species to produce trees with herbicide tolerance, disease and pest resistance, improved wood quality, and reproductive manipulations for commercial plantations is also a major aspect of a tree improvement program. Development of an effective gene transfer and efficient in vitro regeneration system for each hardwood species, that can be easily adapted for many genotypes, will be required to produce genetically improved hardwood trees.

Current Activities:

Research is underway to develop new protocols and improve existing ones for in vitro selection, somatic embryogenesis, micropropagation, adventitious regeneration, rooting, genetic transformation, and clonal propagation of several hardwood tree species. Species of interest include black walnut (*Juglans nigra*), northern red oak (*Quercus rubra*), black cherry (*Prunus serotina*), butternut (*Juglans cinerea*), white oak (*Quercus alba*), green ash (*Fraxinus pennsylvanica*), and white ash (*Fraxinus americana*).

Current Projects: Adventitious shoot regeneration, clonal propagation, rooting, and genetic modification of *Fraxinus* sp. for resistance to the emerald ash borer; Adventitious shoot regeneration, clonal propagation, rooting, and genetic modification of *Prunus serotina* for reproductive sterility; Adventitious shoot regeneration, clonal propagation, rooting, and genetic modification of *Juglans nigra*; Clonal propagation, rooting, somatic embryogenesis, and development of genetic transformation of *Quercus rubra*; Adventitious shoot regeneration, clonal propagation, rooting, and development of genetic transformation of *Juglans cinerea* for resistance to the butternut canker pathogen. This research will allow germ plasm improvement, which in turn will lead to improved hardwood tree production and deployment.

species.

3. **Genetic Modification:** Develop effective gene transfer and efficient regeneration systems for fine hardwood tree species that can be easily adapted for many genotypes.

Recent Publications:

Vengadesan, G. and Pijut, P.M. In vitro propagation of northern red oak (*Quercus rubra* L.). *In Vitro Cellular and Developmental Biology-Plant*. In Press.

Vengadesan, G. and Pijut, P.M. Somatic embryogenesis and plant regeneration of northern red oak (*Quercus rubra* L.). *Plant Cell Tissue and Organ Culture*. In Press.

Du, N. and Pijut, P.M. 2008. Regeneration of plants from *Fraxinus pennsylvanica* hypocotyls and cotyledons. *Scientia Horticulturae* 118: 74-79.

Liu, X. and Pijut, P.M. 2008. Plant regeneration from in vitro leaves of mature black cherry (*Prunus serotina*). *Plant Cell, Tissue and Organ Culture* 94: 113-123.