Recent Publications Include:

Marquard, R.D., E.P. Davis, and **E.L. Stowe.** 1997. Genetic diversity among witchhazel cultivars based on randomly amplified polymorphic DNA markers. J. Amer. Soc. Hort. Sci. 122:529-535.

Krebs, S.L. 1996. Normal segregation of allozyme markers in complex rhododendron hybrids. J. Hered. 87:131-135.

Krebs, S.L. 1995. Enzyme fingerprinting of Rhododendron cultivars. J. Amer. Rhod. Soc. 49:210-215.

ABSTRACTS FROM RECENT PUBLICATIONS: Horticultural Research at The Holden Arboretum

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The Holden Arboretum established in 1931, is the largest arboretum in the United States. Its mission is to promote the knowledge and appreciation of plants for personal enjoyment, inspiration, and recreation; for scientific research; and for educational and aesthetic purposes. Of the Arboretum's 3100 acres, 800 acres support collections and display gardens, while the balance comprise natural areas. The collections include nearly 8000 accessions from 76 plant families; about 700 plant species, some rare or endangered, occupy the natural areas. The education component of the mission connects the Arboretum with the public through school programs, classes, horticultural therapy, and seasonal internships. Two research fellowships are also available. The Holden Arboretum has expanded the research emphasis. The David G. Leach Research Station, part of the Arboretum since 1986, focuses on rhododendron and magnolia breeding and research. Built in 1993, the Horticulture Science Center is a modern research and production facility able to more fully implement and support a broad range of formal horticultural research. The main objective of the research program is to develop superior woody ornamentals for the landscape through hybridization. Additional research emphasizes reproductive biology and using biochemical markers (isozymes and RAPDs) to answer basic questions about the genera under study (*Aesculus, Hamamelis,* and *Cercis*).

Isozyme and RAPID Analyses of Witch Hazel Cultivars

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Numerous isozyme systems were found to be polymorphic in witch hazel *(Hamamelis* spp.). However, aconitase (ACO), malate dehydrogenase, phosphoglucose isomerase (PGI), and phosphoglucomutase were most useful for identification of cultivars. From these enzyme systems, three genes were identified that control

patterns of ACO (2) and PGI (1). Isozymes can be used to help verify cultivars and their simple inheritance could be useful to validate hybrids and gene flow between plants. DNA was readily extracted from young leaf tissue after grinding in liquid nitrogen and extraction in warm CTAB. DNA was amenable to amplification using polymerase chain-reaction technology. Primers (400) were screened to identify polymorphic RAPID bands. Ultimately, 19 primers were used to generate 68 RAPD markers that were reproducible. Cultivars were scored for presence or absence of the 68 markers. Genetic similarities were calculated using a Nei coefficient and clustering was conducted for more than 40 cultivars using a UPGMA program. Arbitrarily, the cultivars were assigned to seven groupings after cluster analysis. The seven classes gave one group each of *H. japonica* and *H. mollis,* two groups of *H. vernalis,* and three groups of H. ×*intermedia.* Clustering allowed some interpretation about relatedness among cultivars and genetic similarity data helped assign some cultivars to a particular taxa that were previously in question.

Rhododendron Root Rot Resistance

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Root rot caused by the soil-borne pathogen *Phytophthora cinnamomi* is one of the deadliest and most costly diseases in rhododendron culture. Unfortunately, the majority of cultivars appear to be susceptible to this fungus. Host resistance does occur, but it represents a tolerance of rather than immunity from the disease. A breeding program has been initiated to develop a broader array of root-rot-resistant cultivars and to determine the genetic basis for resistance. Greenhouse inoculations and screenings of 48 contemporary cultivars yielded seven clones with moderate to high levels of resistance to *P. cinnamomi.* Protocols for evaluation at the seedling stage were developed in order to screen large breeding populations of about 200 seedlings per cross. Root-rot tolerance appears to have low to moderate heritability in these rhododendron populations. Groups of progeny with one resistant parent had a slower mortality rate and higher survivorship (avg. 10%) after 2 months of disease pressure than crosses in which both parents were susceptible (0 survivorship). A recurrent selection strategy is planned to increase the frequency of alleles for resistance in breeding populations of rhododendrons.

Rapid Micropropagation of ×*Chitalpa tashkentensis*

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×*Chitalpa tashkentensis* (*Chilopsis linearis* × *Catalpa bignonoides)* is an attractive small tree producing lavender to white orchid-like flowers. Micropropagation would allow for the rapid clonal propagation of new hybrids for testing cold hardiness and landscape performance. The rapid growth response of *Chitalpa* shoot cultures also

makes it an excellent subject for the study of in vitro growth parameters of woody plants. Shoot cultures were initiated from shoot tips on Anderson's rhododendron medium with MS vitamins, 3% sucrose, 1 μM BA, pH 5.6, and solidified with 0.6% Phytagar. Shoot cultures stabilized rapidly. Two-node microcuttings were placed on modified MS medium (200.1 μM Na2 EDTA and 200.5 μM $FeSO_4$ $7H_2O$), MS vitamins, 3% sucrose, pH 5.6, 0.6% Phytagar and supplemented with NAA (0, 0.5, 1.5, or 3 μM) in combination with BA (0, 1, 5. 10, 15, 20, 30, or 40 μM). Cultures grown on media supplemented with 1 mM BA produced the longest shoots and the most nodes per shoot. Cultures grown on media supplemented with 10 ppm BA produced the most shoots. Microshoots readily rooted on plant-growth-regulator-free MS medium and were easily acclimated.

Use of Chlorophyll Fluorescence in Propagation

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INTRODUCTION

Chlorophyll fluorescence is the small portion of light that is re-emitted from chlorophyll during the processes of photosynthesis. It is an estimation of photosynthetic efficiency and in turn provides an indirect measure of plant stress which is important because stress levels detrimental to the plant are usually present before they are visible to the naked eye. Current applications include the detection/evaluation of environmental stresses such as: cold tolerance (Westin et al, 1995), heat stress (Ranney and Peet, 1994), water stress (Eastman and Camm, 1995), nutrient deficiencies (Strand and Lundmark, 1995), irradiance levels (Layne and Flore, 1993), and air pollution (ozone) (Patterson and Rundel, 1995). It has been used in micropropagation of transvaal daisy (van Huylenbroeck and Debergh, 1992) but until now there have been no experiments involving conventional propagation by stem cuttings.

If a quick, reliable method of determining potential rooting of cuttings based on the condition of a specific stock plant was available for propagators, then rooting success could be predicted prior to an investment in time, labor, and resources. Thus, a reduction in production costs could be realized. Therefore, the objective of this study was to examine chlorophyll fluorescence readings of ten cultivars of *Taxus* over the course of propagation and compare initial fluorescence measurements with subsequent rooting percentages.

MATERIALS AND METHODS

Ten cultivars of *Taxus* were selected for the study: Bobbink, Brownii, Dark Green Pyramidal, Dark Green Spreader, Densiformis, Densiformis Gem, Hicksii, Runyanii, Tauntonii, and Wardii. Cuttings were taken in mid October from field grown plants at Zelenka Nursery, Grand Haven, Michigan, and were placed in cold storage at 2.5C (36F) for 5 weeks. At this time they were recut to a uniform length of 4.5 inches, treated with Woods Rooting Hormone (IAA 1.03%; NAA 0.66%) at 2800 ppm (5 : 1 ratio), and placed into a medium of 100% perlite. The experiment followed a