

CONCLUSIONS

Many different grafting techniques can be used to propagate *Aesculus*, and all of them will produce strong, healthy unions. If one technique more than another produces incomplete healing or more advantageous buds, the propagator should work to perfect the process or utilize another method that produces better results.

Bernheim Arboretum and Research Forest; Eastern Region IPPS Tour Site for 2001[©]

Paul E. Cappiello

Bernheim Arboretum and Research Forest, P.O. Box 130, Clermont, Kentucky 40110 U.S.A.

This poster presentation is designed to introduce I.P.P.S. members to Bernheim Arboretum and Research Forest. As a tour site for the 2001 meeting in Lexington, Kentucky, all members will have an opportunity to visit Bernheim and study the plant collections and facilities. This private, nonprofit institution covers over 15,000 acres of mostly forested Kentucky Knobs land. Plant collections cover primarily woody ornamentals, with over 8000 plants in current inventory. This presentation describes Bernheim's natural resource infrastructure and its research philosophy.

Bernheim Arboretum and Research Forest is a private, nonprofit organization located 20 miles south of Louisville, Kentucky in U.S.D.A. hardiness Zone 6b. This 15,000 acre facility contains approximately 400 acres of arboretum and other publicly accessible areas, 12,000 acres of mostly forested research forest, and over 35 miles of hiking trails. The arboretum's collections contain over 8000 plant specimens with significant collections of *Ilex*, *Acer*, *Viburnum*, *Magnolia*, *Malus*, *Hamamelis*, *Buddleja*, *Hydrangea*, and *Aesculus*. Most of the arboretum's collections have been amassed over the last 40 years. In addition to the woody ornamental plant research, Bernheim maintains an active natural areas program concentrating on natural systems restoration and management.

Bernheim's woody ornamental plant collections are arranged in a roughly taxonomic placement facilitating comparison and study. The soils are primarily clay loam of several designations, with pH typically between 6.6 and 7.0. The record low temperature is -24°F however 0°F to -5°F is most typical for winter low temperature.

One of the major goals of Bernheim's horticultural research program is to conduct rigorous performance evaluation studies on a wide range of local and introduced plants in order to identify those with the greatest potential for success in landscape situations. To insure that Bernheim's plant recommendations are adequately supported, rigorous performance evaluation studies will be conducted. These studies will employ appropriately replicated, scientific study of such features as; cold tolerance, insect and disease susceptibility, growth rate, propagation potential, and potential invasiveness. In addition, ornamental characteristics to be evaluated include summer

foliage quality, floral display, autumn foliage color, fruit display, and any other characteristics appropriate for the species in question. These studies will not only identify attractive, marketable plants that will be ecologically sound choices but will also serve the purpose of clarifying many of the taxonomic and identity questions that are so prevalent in the ornamental plant industry. These thorough studies will insure that growers and gardeners can accurately distinguish the available cultivars of a species as well as make the best choices. These studies should also work to identify plant selections that require fewer inputs. Such well adapted plants should result in fewer ecological insults from fertilizers and pesticides.

An example of a project that addresses the above situation is Bernheim's current *Cornus kousa* project. The native flowering dogwood, *Cornus florida*, is a North American native plant of tremendous popularity in the landscape industry. Unfortunately, this species has shown increasing susceptibility to a number of insect and disease pests, seriously limiting its usefulness in the landscape. Fortunately, *Cornus kousa*, the Chinese analog of *Cornus florida*, has demonstrated superior resistance to these insect and disease problems and is far more adaptable to the conditions typically encountered in residential landscape situations. The superior pest resistance and adaptability of *C. kousa* results in decreased use of pesticides, fertilizers, and irrigation compared to that required for successful culture of *C. florida*.

In recent years, the positive characteristics of *C. kousa* have spawned introduction of a large number of new cultivars; both of *C. kousa* and hybrids with other species. While these introductions have the potential to add significantly to plant diversity in the landscape, most have not been thoroughly tested in this climate. The Bernheim plan is to obtain all the cultivars currently available (currently approximately 90 named forms in the collection) and conduct rigorous field and laboratory evaluations to identify the best forms for use in the landscape trade. With this work completed, local nurseries will be able to carry and recommend taxa that will give the consumer the best chance at successful tree planting and establishment.

Bernheim's plant evaluation projects will also work to help guide nursery producers into production of ecologically sensitive plant selections. At the present time, there is mounting pressure on nursery producers to halt production of potential and known invasive plants, however, there is tremendous economic incentive to continue production. The high consumer demand for plants, such as, *Euonymus alatus* (burning bush) and *Berberis thunbergii* (Japanese barberry), makes it difficult for a producer to halt production. Bernheim's collection and evaluation efforts will work to identify both native and exotic plant species and cultivars that are at the same time ecologically appropriate and highly marketable.

An example of a current Bernheim project that addresses the above scenario is promotion of the burning bush (*E. alatus*) cultivar, 'Rudy Haag'. While the species is known to be a widespread invasive problem throughout much of the eastern U.S.A., 'Rudy Haag' is an almost entirely sterile selection. In 2 years at Bernheim, fewer than 6 viable seeds have been collected from the more than 12 plants in the collection. This number of plants of the species, would typically produce tens of thousands of seeds. An essentially sterile form will pose little or no threat to surrounding ecosystems. An added benefit of this selection is that in addition to being an almost entirely sterile form, 'Rudy Haag' is a far smaller and compact cultivar which will work better in the landscape.

While many arboreta and botanic gardens have focused on international botanical

exploration in search of new species for American gardens, Bernheim has taken a different approach. The goal of the research program is to collect and rigorously evaluate cultivated forms of both native and exotic plant species.

The goal of the cultivar evaluation work is to identify superior plant forms for landscape use. The goal will be to identify plant selections that show less insect and disease susceptibility than other forms, better adaptability to the Kentucky climate, and outstanding ornamental characteristics. In general, the search will be for plants that perform better, with a minimum of input (irrigation, pesticide, winter protection, etc.). The approach will be to identify and collect all known selections of a species and process them through rigorous, replicated evaluation studies.

The above projects will look to evaluate ornamental traits, cultural requirements, insect and disease susceptibilities, and potential for invasiveness. In addition, the projects will seek to eliminate confusion in nomenclature and identity of new cultivar selections. An added dimension of these projects is that they will identify gaps in the present germplasm; where additional selection and/or hybridization work is needed. With the assembled germplasm collection, Bernheim will be positioned to work to fill such gaps with new introductions.

Bernheim's plant evaluation work will focus on woody plants. Species of both local and exotic origin will be evaluated for appropriateness in landscape use. The work will avoid plant groups that have been the subject of previous or ongoing rigorous evaluation projects. For example, hybrid tea roses are evaluated extensively by the All America's Rose Selection program. While local evaluation may add some information to that produced by the AARS program, there are many other plant groups that have received almost no attention. In addition, Bernheim will strive to work with plant groups in which there is currently or is likely to be rapid introduction of new selections. This approach will be essential to address the needs of the homeowner and industry professional in the area of reliable information on new plants coming onto the market.

In 2000, Bernheim initiated an evaluation of *Buddleia* species and cultivars. Over the next several years, one project will be initiated each year so that in the future, Bernheim will be in a position to announce the completion, and release results of at least one evaluation project per year. Several other groups currently listed for similar treatment include: *Cornus kousa*, *Fothergilla major* and *F. gardenii*, *Callicarpa*, *Viburnum*, *Hydrangea*, *Hamamelis*, and *Caryopteris*. All these genera except *C. kousa*, include both North American and Asian species and many include hybrids of the various species.