ORNAMENTAL CHESTNUT TREES

by

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The ornamental value of chestnut trees in the United States was recognized over 60 years ago when the American chestnut *(Castanea dentata)* was extensively used as a street tree. The timing of appropriations by Congress for research on the chestnut blight disease *(Endothia parasitica)* was indicative of its ornamental value. Large money appropriations for studies on the blight fungus, which was ravaging the forests in the early part of this century were not forthcoming until Congress saw first hand the damage wrought by the fungus to the street trees in Philadelphia (Beattie and Diller, 1954). American chestnut trees resistant to the blight fungus are unknown; however, two species introduced from the Orient are resistant and hybrids utilizing these species are worthy of note. Some of the progress made in hybridizing chestnut trees is reviewed in this paper, noting in particular a few selections with ornamental value. It will be observed that problems encountered in the work with chestnut trees are common to other hardwood breeding programs.

The variability among the 13 species of chestnut and the high degree of computability among them has been reviewed elsewhere (Jaynes, 1964; Jaynes and Graves, 1963): Crosses between species to develop improved nut trees were first produced in the late 1800's. By 1920, several years after the discovery of the chestnut blight fungus in 1904, efforts shifted to developing blight resistant trees for forest use. These early efforts concentrated on combining the disease resistance of the orchard type Oriental chestnuts with a tree having the vigor and form associated with the American chestnut. More recently the need and demand for orchard and landscape trees as well as others selected as food producers for wildlife has been given emphasis. Indeed it is these nontimber uses of chestnut trees that are of the greatest immediate potential. Figures 1 to 4 are of four different selections that illustrate some of the variability available in this diverse genus. All of these clones are potential ornamentals.

Figure 1 is an F2 hybrid of the Chinese and Seguin chestnuts *(C. mollissima* x *C. seguinii). It* is of small stature, a prolific bearer of medium to large nuts, and blight resistant. This kind of tree is a valuable nut producer and landscape plant where space is limiting.

Figure 2 is the Sleeping Giant chestnut, a hybrid of the Chinese, Japanese *(C. crenata),* and American chestnut. It is blight resistant, a handsome shade tree, and good bearer of large nuts. Selections of the Chinese chestnut similar to this, except for a smaller leaf and somewhat more spreading growth habit, are used in orchards in southeastern United States and as ornamental nut-trees elsewhere.

Figure 3 is another Chinese-Japanese-American hybrid which was selected for blight resistance and columnar habit. It annually bears moderate crops of small to medium sized nuts.

Figure 4, the Clapper chestnut, is a Chinese-American hybrid of unusually good form, vigorous growth, but questionable blight resistance. Though most often cited as a timber chestnut a tree of this form clearly has potential as an ornamental shade tree.

Commercial utilization of the above trees and similar selections has not occurred because of the difficulties in vegetatively propagating chestnut. For the same reasons many of these clones have not been tested adequately. Grafting on seedling stock, rooting cuttings, as well as specialized techniques such as nut grafting and the rooting of buried-inarch cuttings have not yet proved practical (Jaynes and Messner, 1967). The one development that would most readily facilitate the use of chestnut trees as ornamentals would be an economically reliable method to vegetatively propagate clones.

In addition to satisfactory means of clonal propagation a second major problem confronts us in developing good chestnut selections. That is a reliable test to determine field resistance of trees to the chestnut blight fungus. Young trees are susceptible to the disease and can be inoculated. Unfortunately it has not yet been possible to closely correlate the growth of the fungus from artificial inoculations and known field resistance of the tree. While such a test is not crucial for older selections that have already withstood natural infections, the lack of it is a great handicap in developing new and better selections. What is needed is a screening method that can be used on 1 or 2-year-old trees and that will allow us to cull out all those seedlings that would later prove to have inadequate field resistance. If an efficient method were devised to test seedlings in a nursery, thousands of seedlings could be screened and only the resistant ones kept for field planting and further evaluation of form, vigor, nut quality, etc. Screening for blight resistance, like vegetative propagation, remains a basic problem whether selection is ultimately made for ornamental or timber trees.

Advances of our knowledge in two other areas could significantly affect the development and use of chestnut trees. One would be the development of true breeding selections, eliminating the need for vegetative propagation. Chestnuts are essentially self sterile. So what is desired are pairs of clones that, when placed in isolated plantings and

allowed to intercross, would produce a high percentage of seedlings as good as the two parent selections. This goal may be more readily obtained with orchard-tree types than with forest-tree selections, since, in the former, selections have to be made only within one species, the Chinese chestnut, rather than from complex species hybrids.

A second area worthy of study is the chemotherapeutic value of systemic fungicides. Virtually no testing of such chemicals to control the chestnut blight canker has ever been done. Though such chemicals might well prove too costly to use on forest-tree plantings, their value on ornamentals could be immense.

In addition to trying to solve some of the aforementioned problems we are in the process of establishing plantings using open pollinated seed from the most promising trees we know of. For example, for vigorous, upright growing trees with potential blight resistance we are using seed from trees like the Clapper chestnut that is surrounded by other good trees. One of our best sources in Connecticut for orchard-type trees is a high quality nut tree that is in a small isolated planting of other good nut trees. By collecting seed from selected trees in such isolated plantings where we can be reasonably sure of the pollen source, we avoid the laborious process of making controlled pollinations and obtain more seed than would be possible from controlled crosses; yet genetic gain per generation may be as rapid as from controlled crosses.

The problems of the forester in developing better forest trees are often the same as those of the horticulturist in developing better ornamentals and vice versa, for the production and early care of trees, including breeding, selection and propagation, follow similar practices regardless of the ultimate goal. Hence significant advances by foresters will often have value to horticulturists. In addition virtually any superior forest-tree selection will have at least limited value as an ornamental.

Although there is and probably always will be a need for new ornamentals, it is apparent that there are many selections that are not being used. This is certainly try for the hickories, including pecan, several species of walnut, and the chestnuts, where numerous clones of these species have been given varietal names. The market is available for these selected clones and the nurseryman is anxious to propagate them, but the know-how to do so economically is lacking. Contributions by foresters and others on basic problems such as vegetative propagation and host-parasite relations will have as much or greater impact on the development and use of ornamentals as will the actual production and selection of new clones.

Figure 1.—Second generation hybrid of Chinese and Seguin chestnut, 6 years old.

Figure 2.—Sleeping Giant chestnut, 24 years old. This hybrid was developed and named by Arthur H. Graves at The Connecticut Agricultural Experiment Station. Pollination bags cover some of the flowers.

Figure 3.—Columnar hybrid developed by A. H. Graves at The Connecticut Agricultural Experiment Station and being tested under the number C9. Pole on trunk marked in 1-foot sections.

Figure 4.—Clapper chestnut developed by Russell B. Clapper of the USDA, growing at the Crab Orchard National Wildlife Refuge, Carterville, Illinois. This tree is 20 years old, 10 inches dbh, and 55 feet tall. Note other hybrid chestnuts in the foreground. (Photo by E. Kurmes).

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