ORNAMENTALS: BY-PRODUCTS OF FOREST GENETICS RESEARCH IN SOUTHERN PINES

by

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Recently we have become aware of the steadily increasing demand for ornamental varieties of trees and shrubs. Several federal and state agencies are offering financial support for highway beautification plantings of ornamental trees. Landscaping of parks and buildings, and picnic and camping areas also, presents increasing demands for ornamental plants. The Forestry Research Advisory Committee of the U.S. Department of Agriculture in its 1967 report emphasized the need for ornamental varieties of forest and shade trees.

Although the main objective of our research at the Naval Stores and Timber Production Laboratory is tree improvement for naval stores, we have recognized the potential ornamental value of many of the mutant forms which we routinely obtain as by-products of our principal research effort. Therefore, we felt that we would be fully justified in developing a work plan to accommodate a limited amount of effort to describe and maintain potentially valuable ornamental genotypes. Our principal objectives are: (1) to publish a thorough description of the phenotype of each mutant form; (2) to record as much genetic information as can be obtained incidental to our use of the mutant in our principal research effort; and (3) to distribute propagules to qualified research organizations for further study and distribution to consumers.

Perhaps a brief description of our efforts will serve to encourage other forest research organizations to devote a limited effort to the description and preservation of potentially valuable ornamental varieties.

DISCOVERY OF MUTANT FORMS

Most of the mutant forms presently maintained at Olustee were discovered among families resulting from self-fertilization. This is indicative of the fact that self-pollination is the most productive and most useful technique for recovering mutant forms. The large amount of homozygosity obtained in one generation of selfing reveals large numbers of mutant alleles which may have existed unknown in heterozygotes for hundreds of generations of outcrossing. On the basis of self-pollination in 132 loblolly pines *(Pinus taeda* L.), Franklin (1968) found that approximately one selfed family out of four segregated for a recognizable mutant form. Rudolph (1966) reported the same frequency in jack pine *(P. banksiana* Lamb.). Selfing has several other advantages. We can often make inferences about the mode of inheritance of the mutant based on segregation ratios. Another advantage is that the parent is known, and can be used for subsequent propagation of the mutant forms.

Rarely do we discover a mutant form segregating in a family that' resulted from controlled cross-pollination. Nevertheless, isolated occurrences of apparent mutant forms in wind-pollinated and in controlled cross-pollinated families, as well as in commercial nursery sowings, are not uncommon. These discoveries must be genetically proved because in many instances they are products of the environment rather than the pedigree. In the case of wind-pollinations and controlled cross-pollinations one or more parents are known, and further testing can be done if warranted. By contrast, discoveries in a commercial nursery are without any known pedigree, and are therefore less valuable.

In the course of routine field work, we have from time to time discovered in natural stands and plantations individual trees with aberrant phenotypes of potential ornamental value. One such source of material is the witches'-broom.

Another source of potentially valuable ornamental material lies in the production of artificially induced mutations, but this method does not seem to offer much promise because sexually mature carrier trees are not immediately available, in contrast to the self-fertilization method. In addition, there is some doubt about the efficiency of mutation induction by artificial means, when so many are obtainable by the more preferable method: self-fertilization; e.g., Rudolph (1966).

PROPAGATION OF MUTANT GENOTYPES

We are currently propagating all mutant genotypes which may be of ornamental value. Our objectives are limited to the production of enough propagules for maintenance of the genotype, and for limited distribution of these propagules to qualified research organizations. We actively solicit the cooperation of other research organizations in testing the material. For example, the Department of Ornamental Horticulture, University of Florida, is cooperating with us in this effort.

Propagation can be done both sexually and asexually in most instances. Often one method may be preferred over the other for maximum quality and economy of production of the commercial product. For this reason, genetic information about each mutant form is extremely valuable.

In the process of our limited propagation effort, we are often able to obtain information which can serve as a basis for future work by other organizations. Also, genetic information is often obtained in the course of other research with the mutant genotype. These sources of information should not be overlooked.

Propagation plantings also serve as limited field trials. Often it is a simple matter to include a few check plants appropriately arranged within the planting area. The information thus obtained could serve as a starting point for further research by an organization directly interested in developing ornamental varieties.

DISTRIBUTION OF MUTANT PHENOTYPES

If mutant forms of forest trees are to be utilized as ornamentals, research and commercial organizations must be made aware of their availability. We hope to accomplish this, to some extent, by publishing descriptions of each mutant form which we think may have potential ornamental value. I have also suggested that the U.S. Department of Agriculture initiate a national mutant registry for forest tree species, to be maintained in cooperation with other interested groups. It would be maintained for the purpose of recording and publicizing information on available mutant forms.

ORNAMENTAL MUTANT PHENOTYPES CURRENTLY MAINTAINED AT OLUSTEE

Witches'-broom Dwarf

Although our principal interest in witches'-broom does not concern ornamentals, the dwarfs which segregated in an open-pollinated seed collection from a broom in pond pine *(P. serotina* Michx.) seem to be developing into excellent ornamental specimens. We have also grafted this broom, and it appears that we can successfully propagate this genotype either sexually or asexually. Mutant propagules are dwarfed and profusely branched, but have normal foliage color for the species. The broomed parent tree was discovered near the laboratory in a natural stand of pond and slash pine *(P. elliottii* Engelm.).

Yellow Virescents

We have several forms of yellow virescents from loblolly and slash pine parent trees. In general, they produce bright yellow to pale yellow secondary fascicles. As the season progresses, normal green color replaces the yellow at rates that vary according to the characteristics of the individual genotypes. Some of these forms were discovered in families resulting from controlled breeding for high gum yield. Others were selected in commercial nursery sowings. Certain ones of those discovered through controlled self-pollination have segregated in three to one ratios that are indicative of Mendelian genetic control. Almost all of the propagation of these types has been by grafting.

"Foxtail Form"

We have one slash pine which at 3 years of age had only one small branch on its entire 12-foot bole. It was discovered in a control-pollinated family in a progeny test planting. The genetic basis of this variant is as yet unknown.

Short-needle Slash Pine

This clone has dark green, stiff secondary needles which are only half the length of normal needles in slash pine. In addition, the crown is very dense and growth seems to be retarded. The genetic basis of this mutant is unknown, but the needle characteristics were maintained in all ramets. Crown form varied somewhat between two planting areas. This variation points out the need for further testing by ornamental specialists before the value of the clone as an ornamental or Christmas tree can be assessed.

REFERENCES

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