Forest Tree Improvement Studies at Purdue University

by

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The contributing project from Indiana to Regional Project NC-51 is entitled, 'Development of Planted Conifers and Hardwoods Derived from Selection and Breeding". Its stated objectives are: (1) to determine satisfactory methods for establishing and growing species provided by cooperators in the regional project; (2) to determine ranges in genetic variation as plantations develop in Indiana for comparison with results from other cooperating states; and (3) to determine physiological differences in planting stock provided by the regional project.

In broad outline, these several objectives are being met in the following manner. First, plantations of suitable statistical design have been established within the state from which field data are being gathered on the local variations in growth and development of individual seed sources. Secondly, various methods of planting and cultural control are being tested. And thirdly, greenhouse, growth chamber, and laboratory studies designed to explore differences in resistance of seedlings of various origins to temperature and moisture stresses, and to explain, where possible, observed variations in growth and development, are in their initial stages.

As of this date, efforts largely have been directed towards the establishment of outplantings of stock furnished by states cooperating in the regional project. The most promising planting in this group appears to be a northern red oak (Quercus rubra L.) seed source established this past spring in cooperation with Howard B. Kriebel of the Ohio Agricultural Experiment Station. A randomized block design with three replications forms the statistical basis for the planting. Individual plots are comprised of sixteen trees planted at a 10' x 10' spacing. Survival was excellent this first year, ranging from plots with 90% to several with 100%. The overall survival average was 95%.

Outplantings of Scotch pine (Pinus sylvestris L.) and Austrian pine (P. nigra Arn.) utilizing randomized block designs with 4-tree plots were made in 1961. Unfortunately, low-quality seedling stock resulted in complete failure of the Austrian pine planting and 50% mortality in the Scotch pine.

An inspection of all Scotch pine seed source plantings in Indiana is being planned for the near future, and though the study will be essentially independent of the regional project, the Scotch pine planting established as part of NC-51 is expected to contribute in a material way to the results.

Other plantings on Purdue University woodlands of tree improvement interest include a white pine (P. strobus L.) seed source study established in 1959 and 1960 in cooperation with the U.S. Forest Service, and two plantations of Japanese larch

(Larix leptolepiset Z. Gord.), courtesy of Jonathan W. Wright of Michigan State University.

Work was also begun in 1961 to study cultural means for establishing and maintaining plantations in Indiana of both native and hybrid cottonwoods. With but two growing seasons, these plantations are yielding useful and exciting information. The value of deep planting, first- and second-year weed control, and chemical means for obtaining such control, have already been demonstrated. Studies of planting methods, initial spacing, fertilization, and early pruning are continuing.

Heights attained by the hybrid poplar Populus x euramericana (Dode) Gainier may be of interest. Following the first growing season, the average height of the plantation was 4.8 feet. Several individuals exceeded 7 feet with the tallest being 7.7 feet in height. After the second growing season (1962), the average height of trees growing on weed free plots was 12.5 feet with individuals reaching 15.3 feet.

The third objective of the Indiana NC-51 contributing project, the investigation of physiological differences in planting stock provided by regional cooperators, has been a minor part of our total effort to date. However, I venture to predict that in the future the most significant contributions by Purdue University researchers to forest tree improvement will be made in this area, assuming, of course, that present personnel continue to be associated with the project. Recent changes in staff responsibilities, occasioned in part by the untimely death of Daniel DenUyl and by the addition of research people in soils and physiology, have resulted in a shift of interest towards ecological and physiological aspects of tree improvement.

The present research group, composed of William C. Bramble, W. Richard Byrnes, Clair Merritt, and Arthur H. Westing, feels that basic information having wide practical applicability can be elicited from this approach. Two major avenues of research which they are proposing to explore include the identification of physiological factors contributing to differences in varietal performance, and laboratory techniques for testing and predicting these differences.