SESSION VI

SOUTHERN FOREST TREE IMPROVEMENT PROBLEMS AND RESEARCH PRIORITIES

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SOUTHERN FOREST TREE IMPROVEMENT PROBLEMS AND RESEARCH PRIORITIES:

A Resume of Concern from the
Twelfth Southern Forest Tree Improvement Conference

In accordance with its objectives, the Southern Forest Tree Improvement Committee is seeking an increased voice in the definition of problems, planning of research efforts, and setting of priorities by organizations responsible for forest genetics and tree improvement research in the Southern United States. Individuals organizing the Twelfth Southern Forest Tree Improvement Conference were therefore directed by the Committee to solicit suggestions from conferees concerning existing or anticipated problems and the urgency of their solution. These were to be discussed during the conference, reviewed by the Committee, and entered in the proceedings so that those responsible for planning research programs, allocating research funds, or otherwise influencing research efforts could have ready access to information about tree improvement problems as viewed by those experiencing the need.

Fifty-three of the 120 registered conferees, students excluded, responded to the problems and priorities questionnaire circulated at the conference. Though this represents only 44 percent of the potential respondents, the questionnaires showed that most tree improvement programs in the Southern United States were represented by responses from one or more of their personnel_ Substantial numbers of tree improvement foresters and seed orchard managers responded, further illustrating that a cross section of concern was obtained.

Problem statements submitted by respondents were categorized into nine primary areas of concern. These are listed below along with the percentages of respondents requesting action on them and the degree of urgency attached to each.

Area of concern	Percentage of respondents listing the area of concern	Mean priority ranking assigned by those listing
Cone and seed insect control	64	4.6
Reproductive physiology	38	3.2
Harwood genetics and breeding	30	3.4
Advanced generation pine breeding strategies	28	4.1
Cone and seed harvesting methods	24	3,8
Fusiform rust resistance breeding	23	3.7
Pine pollen management	23	3.0
Forest gene resource conservation	15	4.0
Juvenile/mature correlations	9	4.0

The "mean priority ranking" was obtained by assigning individual problem statements on each questionnaire a numerical rating on a scale from 1 (lowest) to 5 (highest priority). These values were averaged over all questionnaires listing a particular problem to quantify the degree of urgency in that area. By these means, independent expressions of both breadth and depth of concern were achieved. For example, 23 percent of the respondents listed pollen management as a concern, whereas those requesting more information on juvenile-mature relationships were fewer, only 9 percent, but considered their need more urgent.

These measures of concern are supplemented below by discussion of the several problems underlying each area of concern. Supporting information was derived not only from the questionnaires, but also from discussions on the conference floor and from reviews by technical experts on the Committee.

Cone and seed insect control.--The most pressing concern in Southern forest tree improvement is clearly the severe, continuing reduction in cone and seed crops caused by insects. To most respondents, the effort expended on research and development in this area of concern is exceedingly disproportionate to crop value. Concern was expressed for environmental values also. Respondents repeatedly stressed that research efforts should be aimed at developing efficient, but safe controls. If balanced, integrated control systems are to be forthcoming, several lines of attack must be initiated or intensified. Listed in order of their separate priorities, these include:

(1) Development of procedures to efficiently monitor insect impact in seed orchards;

(2) Screening of available and new insecticides and testing of application methods;

(3) Registration of usable insecticides; and

(4) Establishment of biological and behavioral studies involving both pests and their predators.

Pilot tests with available insecticides could hasten development of methods for reducing losses until integrated control systems become available. The infrequency of pilot trials to date has resulted from limited funding rather than a lack of cooperative spirit. Financial restrictions also limit pilot test quality by having inhibited foundation research required for effective direction and coordination. Hence, funding of seed orchard insect research at levels commensurate with crop value is essential to alleviate the problem over both the long and short terms.

Reproductive physiology.--Individuals requesting further effort on reproductive physiology were concerned primarily with rooting improved pine and hardwood materials. Twenty-three percent of all respondents attached moderate priority to this aspect. This information was desired to facilitate research or practical activities by approximately equal numbers of respondents. Other problems within this area included reduction of losses to graft incompatibility, stimulation of early, consistent flowering and improvement of hardwood seed storage methods. Greatest urgency was given to the first of these several problems. Familiarization of plant physiologists with tree improvement problems was also stressed.

Hardwood genetics and breeding.--Interest in this area of concern was substantial, but depth of concern only moderate. This reflects the fact that numerous hardwood programs have been undertaken, but that the total effort is modest in comparison to that with pines. Half of the respondents listing this area requested more and better information on selection systems, trait evaluation, genetic parameters and genotype by environment interactions. The remainder were concerned with provenance testing or establishment and management of improved plantations. Though approximately equal numbers were interested in these latter problems, far greater urgency was attached to the need for information on establishment and management.

Advanced generation pine breeding strategies.--That pine breeders are about to begin the second cycle of selection underscores the need for research on advanced generation breeding strategies. Numerous strategies, moreover, must be developed and tested as no single strategy suits all species, areas, and organizations. This area of concern therefore drew wide attention and respondents listing it considered it second highest in priority. Major concern was expressed for intensified work on mating designs and population sizes, progeny testing methods, selection schemes, effects of relatedness, relative merits of clonal versus seedling orchards, and especially the nature and extent of genotype by environment interactions. A small proportion of the 28 percent listing this area desired new work on wide crossing, synthetic varieties, and economic consequences of advanced generation breeding.

Cone and seed harvesting methods.--This need was of moderate concern in terms of the percentage of respondents, but its solution was considered of above average urgency. Factors contributing to severity of the problem include the large size of many orchards, the short length of the harvest season, and expense or unavailability of labor in most areas. The situation clearly demands mechanized harvesting and most respondents so indicated. Increased attention by more organizations to diverse approaches is essential if development of an efficient system is to be expedited.

Fusiform rust resistance breeding. --Approximately 25 percent of the respondents listed fusiform rust as a problem and accorded it considerable urgency. Rust is not a problem in all areas and as the conference was southwide this degree of response merits serious attention. Individuals listing needs for further work on rust were from the six states with the greatest rust problem and cited as their major concerns our poor understanding of pathogenic variability, its consequences, and the relationship between artificial and field testing procedures. Also frequently mentioned was the need for additional emphasis on cooperative testing arrangements, development and release of resistant strains, and the characterization of site and environmental influences.

Pine pollen management. --This area of concern perhaps drew less attention than merited as its ultimate consequences, lower realized genetic gains, often go unrecognized. A frequent manifestation can be reduced seed yields. Concern is expected to increase as more seed orchards are established or come into production. Solution revolves around insuring control of orchard pollen quality and quantity. A contribution to these proceedings by Woessner and Franklin aptly outlines the problem and research approaches.

Forest gene resource conservation. --Considerable disparity between breadth and depth of interest occurred for this area of concern. Only 8 percent of the respondents listed it, yet they attached great urgency to action. In their view, a select tree registry clearly is needed, though most preferred a regional rather than national undertaking. In terms of preservation per se, respondents and other conferees desired cooperation with the USDA Agricultural Research Service, related Federal and State agencies, and concerned professional societies.

Juvenile-mature correlations. --This problem displayed the greatest disparity between response frequency and priority rating. Few people mentioned it but those that did thought it urgent. The concern here is with time. The ability to select accurately at early ages means short generation intervals, and therefore greater genetic gain per unit time. To define the optimum age at which to take and use measurements, the juvenile-mature correlations for each important trait in each species must be determined.

Mention of these areas of concern underlines their importance as obstacles to full realization of returns from Southern tree improvement programs. Though no doubt imcomplete, this listing does provide a beginning. In this regard, most respondents further expressed the desire for more cooperation and, especially, coordination in research planning. A need also exists for more active synthesis of diverse results as well as increased willingness and means to apply research findings.

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