

Progress Report, Forest Genetics Work
at the Institute of Paper Chemistry

by Dean Einspahr 1/

The genetics program of The Institute of Paper Chemistry is supported in part by several pulp and paper companies and in part by the research funds of the Institute. Major emphasis has centered on the genetic improvement of aspen with particular attention being given to genetic effects upon pulping and papermaking characteristics and to the use of polyploidy in hardwood tree improvement.

Since the last meeting of this conference in August 1955, we have, in addition to the previously described test area on Rhinelander Paper Company land, purchased a 38-acre nursery and test site near Appleton. We also have established test areas in cooperation with the Kimberly-Clark Corporation on a site near Marenisco in Upper Michigan and are fencing a test area near Cornucopia in Northeastern Wisconsin on Cornell Paperboard Company land. Also, we are to have additional laboratory space for cytological and fiber anatomy work when the new wing of the research building is completed.

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our staff has undergone several changes since our last meeting. Dr. Peter Hyypio, who was handling the cytological work, is now with the Botany Department of the University of Michigan and was replaced by Dr. J. P. van Buijtenen in January 1956. The staff includes, in addition to Dr. Joranson and myself, a greenhouse man and a young lady who assists Dr. van. Buijtenen with fiber studies and cytological work.

Work on the improvement of aspen has evolved into three phases: (1) securing of polyploid and desirable diploid experimental material, (2) field testing of experimental material, and (3) determining the relative usefulness of the various experimental materials for pulp and papermaking.

Polyploid materials have been obtained by the treatment of seedlings with colchicine, by hybridization using polyploids as one of the parents, by grafting of material obtained through cooperative exchanges, and by the detection of naturally occurring triploid aspen. Although we have been successful in securing polyploid material via the first three described methods, the location of four clones of naturally occurring triploid quaking aspen has done the most to speed up our progress in investigating the usefulness of polyploidy. One of the triploid clones occurred in northeastern Minnesota, one in Colorado, and two in Upper Michigan. The latter two clones were located about 1.5 miles apart and contained a total of 19 large mature stems which have proven extremely useful in comparing volume growth and pulping characteristics with nearby diploid trees of similar age and site.

Hybridization also received considerable emphasis, with 41 crosses being made in 1955 involving 27 selected parent trees ranging in location, from northern Ontario to central Illinois. Quaking aspen crosses were stressed in 1956 but in 1957 bigtooth aspen work predominated, with 23 crosses involving 19 parent trees being made.

Field testing is well under way with 3 major experimental trials having been established and with plans for 3 or possibly 4 new trials to be established the coming spring. Test materials presently in experimental trials include white poplar, European aspen, a diploid hybrid between European aspen and, quaking aspen, a hybrid between a tetraploid European aspen and a diploid quaking aspen, and several quaking aspen crosses with parents which are widely separated geographically.

Pulping studies, fiber measurements, and work on variability of specific gravity are also in progress. The major concentration in this phase of the program is a study in which the pulping characteristics, paper properties, chemical properties, and fiber dimensions of diploid and triploid aspen are being compared. The wood used in this investigation was obtained by cutting 5 of the naturally occurring triploids (near Bruce Crossing in Upper Michigan) and 5 nearby diploid trees growing under similar environmental conditions. This study is very near completion and results are to be presented at the National TAPPI meeting this winter. Two additional articles dealing with triploids are soon to be released. One article is a project progress report and describes the characteristics of natural

aspen triploids and their recognition in the forest. The second article is a field guide and discusses methods of recognizing triploid aspen in the field.

In addition to the previously described studies, work is in progress on: (1) Inheritance of wood characteristics in aspen, (2) physiology of flowering end rooting of Populus, (3) the effect of irradiation on aspen, (4) the comparative performance of male and female aspen and their sex ratio in nature, (5) the soils of an exceptional stand of aspen having cubic volumes from 40.8 to 93.0 cords per acre, (6) a tree selection index for aspen, (7) the possible existence of an unequal chromosome pair and its relation to the sex of the tree, and (8) a method of fumigation for the control of flower bud larvae.