

GENETICS OF WHITE SPRUCE, LARCHES AND HARDWOODS,  
PETAWAWA 1981-1983

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In the past two years a significant amount of time has been devoted to new provenance experiments in white spruce (Picea glauca (Moench) Voss) and tamarack (Larix laricina (Du Roi) K. Koch), and to assembly of clonal breeding populations of white spruce and European larch (Larix decidua Mill.). Much of this work has been enhanced by increased use of isoenzyme analysis in the study of population genetic structure and mating systems. In addition, existing research on the genetics of white spruce, larch and hardwoods has been continued with the analysis and interpretation of data collected in experiments referred to in proceedings of previous C.T.I.A. meetings.

WHITE SPRUCE

Provenance

For many years high priority has been given to research into identifying and quantifying range-wide and regional genetic variation in white spruce. By 1983 the establishment phase of a new series of cooperative range-wide provenance tests (Ying 1980) was almost complete. White spruce seeds have been sent to cooperators in seven provinces in Canada and four states in the U.S.A. Records show that 30 provenance tests have already been planted. Staff from Petawawa National Forestry Institute (PNFI) and the Ontario Ministry of Natural Resources (OMNR) have been active in the field in Ontario where five range-wide and eight regional provenance tests have been planted in different environments across the province. Genecological research will continue to be an important part of the research effort on white spruce as data from these and older tests are collected, analyzed, and published.

Breeding, Selection and Progeny Testing

Increased emphasis is being given to research that will provide basic quantitative genetic information with potentially broad application to the development of breeding strategies for white spruce in advanced generations. Work begun in 1982 includes the assembly of a breeding

population that will contain about 400 white spruce clones selected from the local Upper Ottawa Valley population. So far, 247 trees in 28 stands have been selected visually on the basis of general vigour and stem form. Selection and grafting should be complete by 1985. Some of this work was done in cooperation with the OMNR which will include many of the selections in a seed orchard. A progeny test was planted at close spacing in the PNFI nursery with open pollinated seed from four of the selected trees in each of eight stands. Progeny performance in this test will be compared with that in conventional field tests.

The genetic structure and mating system in several stands of white spruce have been studied using isoenzyme analysis techniques. This work is discussed in a report by Cheliak and Pitel in these proceedings.

## LARCH

### Native Larch

Although seeds for use in a range-wide provenance test of tamarack have been received from 105 locations in Canada and the U.S.A., parts of the range have still been inadequately sampled due to poor seed production. However, information about available seed are being sent to cooperators in order that progress can be made with design and establishment of field tests. Efforts are being made to fill serious gaps in the distribution of samples.

Isoenzyme analysis of samples of the tamarack seed collected indicates that there is a high degree of inter-stand variation.

### Exotic larches

Plantations of European larch established at several different locations since the 1950s have provided strong evidence of variation in growth, stem form, and branch habit within and among seedlots or provenances. Superior, hardy phenotypes in those plantations have been identified. Scions from 115 of the selected trees have already been grafted and planted at PNFI to start a foundation population for use in research on land race development.

Evaluation and treatment of Japanese larch (Larix leptolepis (Sieb. and Zucc.) Gord.) plantations in Ontario and Quebec have been continued, mostly by cooperators in the OMNR and the Canadian International Paper Company.

## HARDWOODS

No new research on the genetics of hardwoods has been undertaken since the previous Member's Report was submitted. Activity has been limited to evaluation and tending of existing plantations of white ash (Fraxinus americana L.), green ash (Fraxinus pennsylvanica Marsh.),

paper birch (Betula papyrifera Marsh.), and Norway maple (Acer platanoides L.).

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