

GENETIC IMPROVEMENT AS APPLIED TO LARCH

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Because of their relative ease of propagation and establishment in the field, and because of the value and versatility of their wood, the primary attention of the tree improver has been and probably will continue to be on the conifers--trees that, in the Northeast, have relatively modest site requirements, that are easy to establish on land suitable only for forest crops, and that can, if desired, be managed on short rotations.

I have long had a strong interest in trees of the genus *Larix*. After forty years of growing and watching those species that will thrive in the Northeast, I am persuaded that the larches offer tremendous opportunity for continued progress through genetic improvement. Already, by nothing more complicated than observation and selection, we have made substantial progress in sorting out the unsuitable provenances, by collecting seed from only our best trees and stands, and, by so doing, providing better stock for reforestation in our region. And the end of such betterment is nowhere in sight!

What, then, are the particular merits of larch that commend it for tree improvement--the subject of primary interest to this Conference?

Asexually, it is possible to graft scions from mature larches onto seedlings and so to quickly produce easily-worked orchard trees. If there be any question of the effect of stock upon scion, softwood cuttings from young trees can be rooted in a mist chamber.

Seedlings, especially of the hybrids, begin to produce female flowers by the tenth year and workable crops may be had by age 20. This means that seedling seed orchards are entirely feasible and that the generations need not be more than a dozen years apart.

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Plantable seedlings of all the acclimated species can be nursery grown in two seasons; with some improvement in technique, it might be possible to produce them in a single year. (Our current nursery techniques produce something like five percent of one-year seedlings fit for field planting.)

There is a suspicion, still lacking long-time experimental confirmation, that the phenotypic characteristics of each new generation are strongly inherited from the female parent. (In a wind-pollinated tree like the larch, who can tell much about the male parent?) If this be broadly true, the gathering of open-pollinated seed from outstanding mother trees offers a quick, easy, and relatively safe way to improve the race. Empirically, we do know already that certain mother trees consistently yield progeny of superior quality.

Among the larches, hybrids come easily; most of them exhibit hybrid vigor and there is as yet no evidence, with us, that this vigor diminishes with succeeding generations. Of course, a few individuals in each generation--perhaps one or two per thousand--show aberrations of form, foliage, or vigor. Such oddities are of no practical consequence in plantation management, as they occur at random and are readily liquidated in thinning.

The larches are genetically plastic trees and, even within seemingly pure strains of a single species, they show considerable internal variation.

Stem form and branching, which are specific characteristics of some races, are variably inherited by the hybrids so that, in any given seedlot, trees of different characteristics can be found, providing a sound base for thinning.

Except for sporadic infections of the root rot, Armillaria mellea, and defoliations by the larch sawfly, these trees are reasonably free from such problems. The porcupine is always an unmitigated pest!

So, given a proper combination of genetic quality and suitable site, the larches can develop into fine trees, easy to manage, and of high timber quality. What more can the tree improver and the forester ask of one tree?

The basic objectives of forest tree improvement will be to develop, for the use of the forest manager, trees that can and will grow BIGGER, BETTER, FASTER, and CHEAPER to provide raw material for the forest industries and perhaps added beauty to the landscape. Consider how the larches can fulfill these goals.

BIGGER: The larches are great forest trees, with maximum sizes and ages far beyond anything that a prudent forest manager would attempt to grow. If we assume an economic maximum size of 20 inches dbh, this can be accomplished with ease and in a relatively short time, and with trees that are still sound and vigorous.

BETTER: We now know enough about the genetic characteristics of our several species, races, and hybrids to recognize those that are suspect of having inherent unsatisfactory characters, such as crooked or wavy stems or overly long and heavy branches. We also know enough about their silvicultural requirements to maintain workably compact crowns, permitting relatively dense stocking without a sacrifice in volume production, either individually or in mass.

FASTER: This is the characteristic in which the best larches excel! Long ago I put forth the formula that, on mutually suitable sites, larch would outgrow red pine by 3 to 2, any other commonly planted conifer by 2 to 1, at least up to

Fifty years, and do it on something less fertile than top-quality farmland. But that estimate was based on the limited experience of two or three decades ago and on larches of unknown and perhaps not too satisfactory origins. With trees from suitable provenances, and especially with the hybrids--notably the Dunkeld hybrid of European onto Japanese or its reciprocal--the disparity in favor of larch can be considerably greater.

What other tree, planted as a two-year seedling on an average forest site, with minimum site preparation, will grow to be six, eight, ten, or even twelve feet tall in the first three or four years, and so outdistance its competitors--hardwoods, softwoods, and weeds alike?

What tree will cast down, each autumn, such a blanket of needles to smother the lesser elements of the flora and so to reduce the need for silvicultural help?

What other tree on an average forest site will produce a cord, a cord and a half, or maybe two cords per acre per year?

And, what other tree will do better at beautifying the landscape, or turn to more brilliant autumn gold?

CHEAPER: Larches for field planting are usually distributed by the nurseries 2-0 seedlings--cheap and relatively easy to grow. While larch used to have a reputation for being tricky, difficult, and unpredictable, we now know that most of the trouble was with the people, not the trees. Today, larch can be handled at least as satisfactorily as other conifer planting stock. Personally, I would consider a survival of less than ninety percent as a reflection on my ability as a tree planter!

Larch can be set at relatively wide initial spacings--6 x 10 foot, 7 x 12 foot, or even 6 x 20 foot--which saves substantially on establishment costs and on early, lasting thinnings. They are easy and cheap to prune--something required for access even more than for stem quality.

And, when harvest time comes, these tall, single-stemmed, and lightly-limbed trees make for cheap and easy logging.

As a commercial tree to be grown on either a short rotation for pulpwood or a somewhat longer one for sawlogs, piling, or veneer, the larches have no equal!

To the tree improver, they offer tremendous opportunity to produce even better trees than we now have through the selection and hybridization of the best of the wonderful trees that nature has given us.

So much for the tree--what about us people!

We already know that we have some superior seed sources and that progeny from them have been planted out over at least the past decade. But, who is going to do the legwork of inspecting these many and widely dispersed plantations, to determine their quality, their vigor, and their inherent variation--for these offspring are the test of whether their mothers are, indeed, ELITE trees! Somewhere, somehow, and, before the "old hands" that started the screening are gone from among us, some agency should put in money and effort to screen this "first selected generation."

Knowledge is the accumulation of seemingly firm and demonstrable facts. Wisdom is the application of such facts to practical problems. Of the former, we have a substantial body. Of the latter, we have yet to exhibit any significant amount!

Let us get on with our work!