Influence of Interstock on Flowering and Growth of Loblolly Pine Grafts

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Scions from five dwarf and four normal, vigorous trees were used as clonal interstocks for loblolly pine grafts. Interstock affected growth and flowering substantially, but the effects were not related to the vigor of the tree providing the interstocks.

Growth and flowering of grafted Southern pines can be strongly influenced by the origin of the rootstock on which they are grafted (*3, 4*). This is true for rootstocks of different species, as well as for full- or half-sib families of the same species. Using clonal rootstocks would allow the best control of rootstock variation, but most pine species are difficult to propagate from cuttings. Clonal interstocks, where a short segment of stem is grafted between the rootstock and the scion, have been effectively used in fruit trees for controlling size and enhancing fruit production for many years (*2*). Recent work has indicated that using an interstock from a genetically dwarfed tree may control the size of loblolly pine *(Pinus taeda L.)* grafts (*1*).

In the research reported here, the effect of interstocks from dwarf and normal trees on growth and flowering of loblolly pine grafts was studied.

Materials and Methods

Scions from six loblolly clones, one Sonderegger (natural hybrid between loblolly and longleaf (*P. palustris* Mill.) pines) clone, and two shortleaf (*P. echinata* Mill.) clones were first grafted onto bulk loblolly rootstocks in 1969. In 1970, scions from two loblolly clones were grafted on top of these grafts in all possible combinations of scion clone and interstock. More than 200 grafts were made originally, but after mortality, only 75 remained for outplanting in the fall of 1970.

The interstock clones were chosen from 15-year-old experimental plantings. Two of the loblolly clones were extremely slow-growing, abnormal-looking dwarfs. The other four clones were extremely vigorous, ranking in the top 2 or 3 percent for height growth in the planting. The Sonderegger and the two shortleaf clones were also dwarfs.

Male and female strobili were counted yearly; heights and diameters were measured at 3, 7, 9, and 11 years. Ramets showing signs of incompatibility, such as scion overgrowth or yellowing, were considered nonsurvivors. In the fall of 1978 and 1979, a five-cone sample was collected from each study tree. Seeds were extracted and full seeds were separated from empties by ethanol flotation and then weighed. Differences in means were tested by

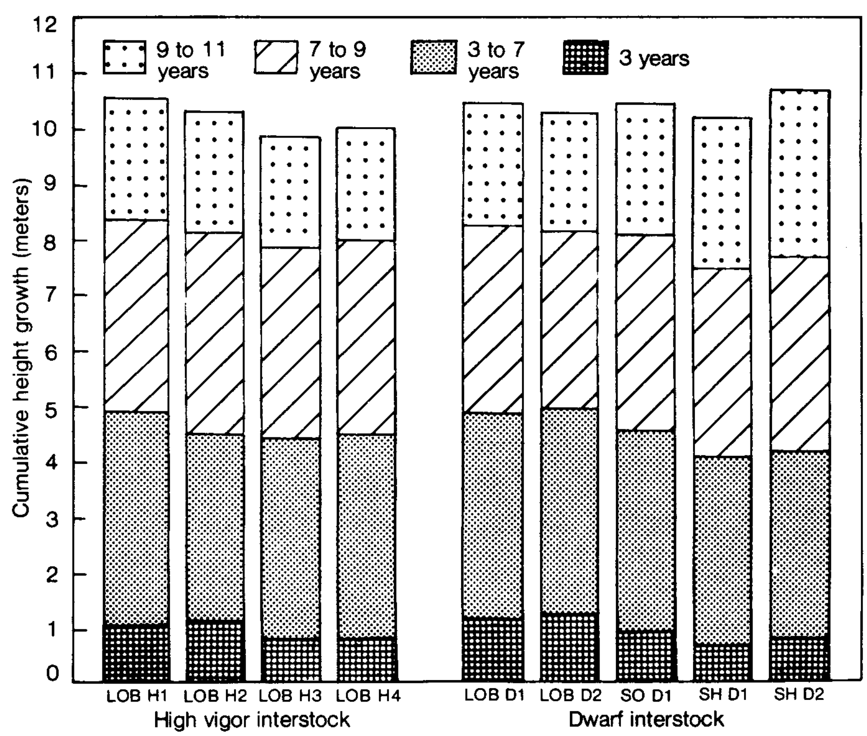

Figure 1.—*Cumulative height growth of interstocks up to 11 years of age.*

analysis of variance at the 0.05 level of probability.

The experimental planting was maintained in seed orchard fashion; that is, mowed yearly and fertilized every other year. Furadan was applied in February of 1978 and 1979 to control seed and cone insects.

Results and Discussion

Initially, grafts on two of the dwarfing interstocks, shortleaf D_1 and D_2, grew much more slowly than the other grafts, averaging only one-half meter in height after 3 years (fig. 1). This apparent dwarfing effect disappeared with time. Grafts on these two interstocks averaged the same as the other grafts, about 10.2 meters after 11 years (fig. 1).

Growth of the grafts on the other three dwarf interstocks was comparable with growth of the grafts on high-vigor interstocks; all averaged about 1 meter tall at 3 years. Differences in height among interstocks were statistically significant at 11 years, but they did not vary according to the vigor of the ortets used for interstock.

Diameter at breast height (d.b.h.) of the grafts also differed significantly by interstock, ranging from 19.8 to 22.5 centimeters (table 1), but was not less for dwarf interstock grafts.

Flowering was significantly affected by interstock (table 1). Interstocks were as effective, or even more effective, in causing variation in flowering than the rootstocks used in previous studies (*4*).

Average male flowering ranged from 63.8 flowers for the poorest (shortleaf D_2) to 163.9 for the best (Sonderegger) interstock. Average female flowering did not vary as much as male flowering, ranging from 38.8 strobili per ramet on shortleaf D_2 to 77.5 strobili per ramet on loblolly H_2.

In male and female flowering, variation within loblolly interstocks was as important as variation among species of interstock. No greater variation was induced by using shortleaf or Sonderegger interstocks than was obtained by simply using different loblolly clones for interstock. Thus, interspersing even a small (20- to 40-cm) piece of stem of a foreign genotype affects flowering in loblolly pines, as it does in many fruit trees.

Interstock did not affect cone and seed yields.

Table 1.—*Flowering and growth of loblolly scions grafted on interstocks from high vigor and dwarf trees*

Interstock	D.b.h. at 11 years	Female flowering, 6-year average	Male flowering, 6-year average
	Cm	*Cm*	
High vigor			
Loblolly H1	21.4bc[1]	61.8c	127.3b
Loblolly H2	20.5abc	77.5c	122.1b
Loblolly H3	20.4ab	.1a	66.4a
Loblolly H4	22.5c	67.3c	98.8ab
Average	21.1	62.7	103.6
Dwarf			
Loblolly D1	21.2abc	59.7bc	116.5b
Loblolly D2	20.8abc	.5c	105.8ab
Sonderegger	21.9bc	.0c	163.9b
Shortleaf D1	19.8a	48.1ab	63.8a
Shortleaf D2	20.2ab	38.8a	59.9a
Average	20.8	55.2	102.0

[1]Means followed by the same letter are not significantly different according to Duncan's multiple range teat.

Conclusions

Interstocks can have substantial effects on flowering and growth, but their use in orchards would be limited by the time and expense of grafting twice. In any case, there does not seem to be any certain way of predicting the performance of an interstock short of actual testing. Previous vigor of the ortet used for interstock was no indicator of growth or flowering of the grafted ramet in this experiment.

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