

Some Morphological Variations Among Loblolly Pine Seedlings

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One-year-old nursery-grown seedlings of loblolly pine show much variation in the type of

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needles formed, development of the terminal winter buds, and in the formation of height-growth flushes. In east Texas, for example, 1-0 loblolly pine seedlings may represent all developmental stages from the "juvenile" type, with only primary needles and no terminal bud, to the "mature" type with abundant secondary needles and two completed height-growth flushes, possessing a well-developed winter bud.

The author observed that loblolly pine seedlings grown from locally-collected seed in the Stephen F. Austin State College forestry nursery showed a high degree of morphological variation which could not have been attributed to differences in age or microenvironment. Some seedlings stopped height growth in late August, while others grew until the first chills in October.

Also, 2 to 4-year-old loblolly pine seedlings grown in the nursery did not cease seasonal height growth at the same time: some ceased terminal elongation by the middle of August, while others grew until late September. Trees stopping elongation early terminated their growth with a conspicuous terminal bud and well-developed secondary needles on the latest flush of growth. Late-growers, however, ended seasonal height growth at any stage of flush development, thus suggesting that height growth was arrested by the unfavorable environment rather than by inherent physiological conditions.

The above supposition is supported by an experiment conducted in an air-conditioned greenhouse. Seeds collected from ten open-pollinated loblolly pines were germinated in petri dishes during the month of May and then planted in individual 2-1/4-inch square jiffy pots filled with top soil. The labeled pots were arranged in 12" x 12" x 4" wooden flats on tables. The temperature in the greenhouse ranged between 75 F and 85 F and the relative humidity varied between 35 and 85 percent. The light intensity was reduced by 20 percent with a nylon netting, and the photoperiod remained natural.

Morphological development of each seedling in each of the ten progenies was recorded periodically for one year. One of the conspicuous morphological variations was cessation of seasonal height growth and formation of terminal winter buds. Table 1 represents the data pertaining to winter bud development on October 15, November 21, and February 25.

Table 1. Percentage of seedlings having conspicuous terminal buds.

Tree No.	Number of seedlings in progeny	Percentage of seedlings with conspicuous terminal buds		
		Oct. 15	Nov. 21	Feb. 25
I	73	40	27	23
II	318	70	76	44
III	173	36	26	24
IV	268	29	26	20
V	467	60	60	47
VI	257	93	93	68
VII	57	88	91	53
VIII	40	73	68	43
IX	44	57	59	32
X	73	81	81	41

Most pronounced differences existed between progenies IV and VI. Most of the seedlings in progeny VI completed their height growth by the end of August; and in the middle of October, 93 percent of them had well-developed terminal buds and abundant secondary needles. Only 29 percent of progeny IV developed terminal buds by the middle of October, while the remaining 70 percent continued to grow through the entire winter. Most of the continuously growing seedlings in progeny IV had a "juvenile" appearance: very few secondary needles, bluish-green stems, and a shortleaf-like crook at the root collar. The winter-bud forming trees in progeny IV had the general appearance of progeny VI except for the shorter secondary needles and less conspicuous terminal buds.



Figure 1 -- Example of variation in progeny of Tree No. IV

Since seedlings of individual progenies were randomly distributed over 72 flats, and the environment was relatively uniform, the variation in the growth habits was attributed to the inherent characteristics of the individual plants. It was concluded that in central east Texas, early cessation of height growth of at least some loblolly pine seedlings might be caused by inherent characteristics of the plants themselves. It also appears that natural hybridization between loblolly and shortleaf pines might be responsible for a high degree of morphological variation in loblolly pine seedlings in eastern Texas.