Dry-Matter Content of Loblolly Pine Needles Appears Unrelated to Geographic Seed Source

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VARIATIONS IN dry-matter content of needles, found highly useful by Langlet (1936-37, 1959) as an indicator of racial variation in Scotch pine (*Pinus sylvestris* L.), appears to offer little or no promise of similar utility with loblolly pine (*P. taeda* L.)

The existence and the economic importance of racial variations in southern pines, particularly loblolly pine, have been demonstrated beyond question (Bercaw 1955; Sherry 1947; Wakeley 1944, 1954, 1959; Zobel and Goddard 1955). A Southwide study of geographic sources of seed of longleaf (*P. palustris* Mill.), slash (*P. elliottii* Engelm.), loblolly, and shortleaf (*P. echinata* Mill.) pines was begun in 1951 to define seed-collection zones for these species (Wakeley 1959). Of necessity, however, the geographic sources represented are so widely separated that boundaries of collecting zones will be only roughly determinable from the data.

To test the possibilities of supplementing and refining results by means of Langlet's technique, dry-matter contents of needles of the previous year were determined in 1957 for loblolly pines of various geographic origins. Table 1 lists the seed sources and the locations of the plantations. The sources represent very nearly the extremes of latitude, longitude, and climate within the natural range of loblolly pine. Unless dry-matter content of needles varied significantly and consistently among the sources representing these extremes, it could not be expected to indicate racial variations occurring within more limited portions of the range, and hence could not be used to refine results based upon outplantings.

Trees in Pearl River County, Mississippi, were sampled shortly after the start of their fifth growing season in the plantation and sixth from seed. Those in Rapides Parish, Louisiana, were sampled during their 21st growing season in plantation. Circumstances precluded sampling in the dormant season, as preferred by Langlet (1936-37), but Scotch pine gave indicative differences at other seasons also; and Meyer (1928, 1932), working with pitch pine (*P. rigida* Mill.) in Ohio, where the environment is more like that of loblolly pine than of Scotch pine, found the moisture content of mature needles about the same in winter as in summer.

Preliminary tests were run to develop techniques that would minimize variations in dry-matter content arising from collection, transportation, preparation, and drying of samples. Then, on April 27, comparable needle samples were collected from 4 trees in each of 4 replications of each source in each series in the Pearl River County plantations. On June 18 samples were collected

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Portion of a thesis submitted by the senior author in partial fulfillment of the requirements for the M.F. degree, Louisiana State University. McLemore and Wakeley are members of the Southern Forest Experiment Station, Forest Service, U. S. Department of Agriculture. Crow is Associate Professor of Forestry, Louisiana State University, Baton Rouge, La. Manuscript received Jan. 27, 1961.

Reprinted from FOREST SCIENCE, Volume 7, Number 4, December, 1961
Purchased by U. S. Forest Service for Official Use

similarly from 4 trees in each of 3 replications of each source in the Rapides Parish plantation.

Samples were dried at 65°C for 48 hours in an electric oven. Following Langlet, dry-matter content was computed as a percentage of fresh weight, equaling

$$\frac{\text{oven-dry weight}}{\text{fresh weight}} \times 100.$$

Mean percentages were calculated for sources and for replications within sources. The latter were subjected to analyses of variance, the former (shown in Table 1) to regression analyses.

The dry-matter contents of sources did not vary significantly in series 1 in Pearl River County, or in the Rapides Parish plantation. Variation among sources in series 2 in Pearl River County was significant at the 5-percent level but was not correlated with latitude of source. In fact, no relationship could be found between differences in dry-matter content and climatic conditions at the various points of seed collection. Specific variables investigated were mean annual precipitation, mean January and July temperatures, length of growing season, and (in an attempt to approximate moisture stress), mean annual precipitation divided by July temperature. Nothing directly involving climate suggested itself as an independent variable over which dry-matter content regressed. Series 2 in Pearl River County suggested a possible association of dry-matter content with physiographic province of seed source, but this was refuted rather than confirmed

TABLE 1. Proportionate dry-matter content of needles from various sources.

Pearl River County, Mississippi		Rapides Parish, Louisiana	
Source by county	Dry matter	Source by county	Dry matter
	Percent		*Percent*
Series 1: Range in latitude from 30°30′ to 38°10′ N. Range in longitude from 75°45′to94°40′W.		Range in latitude from 30°15′ to 38°25′ N. Range in longtitude from 75°40′ to 95°30′ W.	
Angelina, Tex.	44.50	Trinity, Tex.	48.22
Onslow, N. C.[1]	43.53	Ashley, Ark.	47.65
Clark, Ark.[1]	43.13	St. Tammany, La.	47.61
Somerset, Md.	43.06	Natchitoches, La.	47.42
Pamlico, N. C.	42.99	Edgefield, S.C.	47.37
Wilcox & Crisp, Ga.	42.99	Winston, Ala.	46.95
Clay, Ala.	42.60	Leon, Fla.	46.88
Livingston, La.[1]	42.52	Wicomico, Md.	46.54
		Montgomery, Tex.	46.51
Series 2: Range in latitude from 30°30′ to 35°10′ N. Range in longtitude from 77°30′ to 93°15′ W.		Onslow, N.C.	46.37
		Jefferson, Miss.	46.31
		Charles City. Va.	45.63
Onslow, N.C.[1]	43.76		
Livingston, La.[1]	43.30		
Clark, Ark.[1]	42.78		
Prentiss, Miss.	42.76		
Jefferson, Ala.	42.60		
Hardeman, Tenn.	42.58		
Newberry, S.C.	42.36		
Clarke, Ga.	41.54		
Spalding, Ga.	41.31		

[1]Common to series 1 and 2 in Pearl River County.

by the Rapides Parish results.

Dormant-season retrials may be warranted with loblolly or other southern pines. It is surmised, however, that the contrast between Langlet's results and those reported here is attributable primarily to the greater importance of low temperatures in the evolution of Scotch pine, which occurs at higher latitudes than loblolly pine.

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