Longleaf Pine Cone Maturity Is Independent of Pollination Date

By B. F. McLEMORE and H. J. DERR
Southern Forest Experiment Station
Forest Service, U. S. Department of Agriculture, Alexandria, Louisiana

(Received for publication December 15, 1964)

Data from longleaf pines (Pinus *palustris* MILL.) in central Louisiana show no relationship between date of maximum flower receptivity and cone maturity. The time required for seed development on individual trees is constant, but varies as much as 4 weeks between trees. Among trees, the order of cone ripening is highly correlated from year to year, suggesting this variable as a basis for ranking trees in priority of cone harvest.

Longleaf pine cones can be safely harvested when their specific gravity drops to 0.88 or less (WAKELEY 1954). Seeds in cones at this stage are mature and will be released when drying reduces cone specific gravity to the range of 0.68 to 0.72. Seeds forced from cones with specific gravities above 0.88 have reduced viability, indicating that seed maturity and cone maturity are closely correlated (MCLEMORE 1959). Although there is little variation in date of ripening for cones on a single tree, differences of 3 to 4 weeks are not uncommon between individual trees.

Similarly, strobili on a single tree develop at the same time; stages of development vary by about 2 weeks between trees; and flower development among trees follows the same order each year. Possible correlation between cone maturity and date of maximum flower receptivity was tested with trees having recorded dates of pollination.

Methods

In the spring of 1962, 23 longleaf pines from the same stand were selected for controlled pollination. The trees were similar in age and size, averaging about 16 inches in diameter and 45 years of age. They were examined at 1- to 3-day intervals from the time flower buds started to enlarge, and the flowers on each tree were pollinated when they reached the stage of maximum receptivity (CUMMING and RICHTER 1948). Dates of pollination ranged from March 2 to March 12.

On October 15 of 1962 and 1963, four representative cones were selected from each of the 23 trees, and the specific gravity of each was determined to the nearest 0.01 by the water displacement method. As within-tree variations were small, an average specific gravity was computed for each tree. The averages ranged from 0.70 (cones releasing seed) to 0.96 (cones immature). Cone volumes also varied widely among study trees, but the correlation of cone volume with specific gravity was nonsignificant.

Since two years are required for pine cones to reach maturity, dates of flower receptivity in 1962 were compared with specific gravities of cones in 1963.

Results and Discussion

A scatter diagram in which average cone specific gravity in 1963 is plotted over date of maximum flower (female strobili) receptivity in 1962 indicates no correlation between the two variables. The correlation coefficient is —0.23, well below 10.40 needed for significance at the 95-percent level. Random variation in length of time required for seed to mature is illustrated by two trees that were both receptive on March 8. On October 15, cones from one tree had the highest specific gravity in the 23-tree sample (0.95), while those from the other had almost the lowest (0.71). Thus. harvesting of cones from individual trees or clones should not be based upon the order of flower receptivity. Use of such a guide may result in case-hardening of cones picked prematurely, or loss of seed from cones that open early.

The specific-gravity data provided a useful clue for ranking trees or clones in order of cone maturity. Tree for tree, there was a high degree of correlation ($r = +0.90$) between the average cone specific gravity recorded on October 15 in 1962 and 1963 (Figure 1). Supplemental data recorded on October 14. 1964, substantiated this relationship.

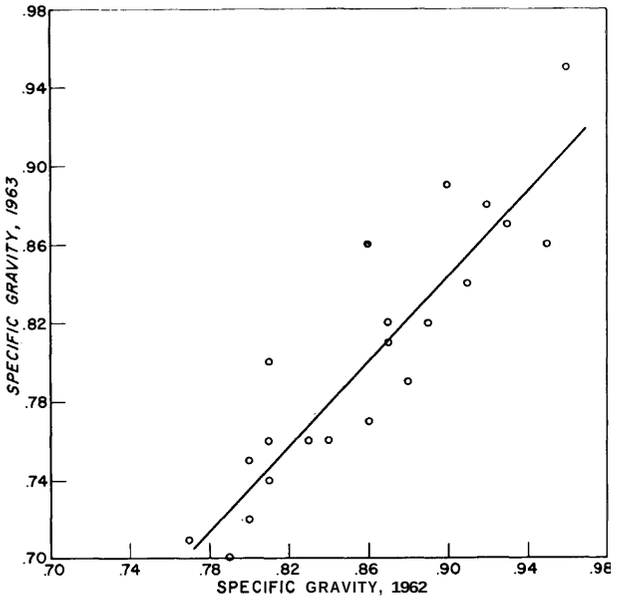

Figure 1. — Relationship of specific gravity of longleaf pine cones on October 15 of two successive years.

Despite the wide tree-to-tree variation in date of cone maturity and differences in weather during the 3 years of observation, the order of cone ripening was nearly identical each year. Hence, when cones must be collected from large numbers of treec or clones in successive years, a determination of cone maturity by specific gravity for a single year may be a guide for order of collections from the same trees in subsequent years.

Eiterature Cited

CUMMING, W. C., and RICHTER, F. I.: Methods used to control pollination of pines in the Sierra Nevada of California. U. S. Dept. Agr. Cir. 792, 18 pp. (1948). — MCLEMORE, B. F.. Cone maturity affects germination of longleaf pine seed. Jour. Forestry 57: 648—650 (1959). — WAKELEY, P. C.: Planting the southern pines. U. S. Dept. Agr., Agr. Monog. 18, 233 pp. (1954).