Light During Stratification Hastens Dark-Germination of Loblolly Pine Seed

Note by B. F. McLemore [1]

Abstract. The amount of light that *Pinus taeda* L. seeds require for germination is reduced by cold moist stratification aimed at breaking seed dormancy. Irradiation with white light during stratification further fulfills the light requirement of these seeds.

THE DORMANCY of loblolly pine seed exceeds that of the other southern pines, and cold moist stratification to hasten germination has been standard practice among foresters ever since the researches of Barton[2]. Nelson[3] first noted the necessity of light for germination of southern pine seed. More recently, Toole *et al.*[4] have shown that the germination of stratified loblolly seeds can be repeatedly promoted and reversed by irradiation with red (6600 Å) and far-red (7300 Å) light, respectively.

[1] Southern Forest Expt. Sta., Forest Service, U.S. Dept. of Agriculture. Manuscript received Jan. 10, 1964.

Pine seed is usually stratified in darkness as a matter of convenience, and is nearly always tested for germination in light. In the research reported here, light was supplied during stratification, rather than afterwards. Germination was tested in darkness to avoid confounding the results with light received during stratification.

The seed had been collected in central Louisiana during the fall of 1960 and stored for 2 years with 8 percent moisture content at 5°. All empty seeds had been removed by flotation in

[2] Barton, L. V. Hastening the germination of southern pine seeds J. For. 26:774–785. 1928.

[3] Nelson, M. L. Light influences germination of southern pine seed. U.S. For. Serv. Sth. For. Exp Sta. Sth. For. Notes 31. 1940.

[4] Toole, V. K., E. H. Toole, H. A. Borthwick, and A. G. Snow, Jr. Responses of seeds of *Pinus taeda* and *Pinus strobus* to light. Plant Physiol. 37:228–233. 1962.

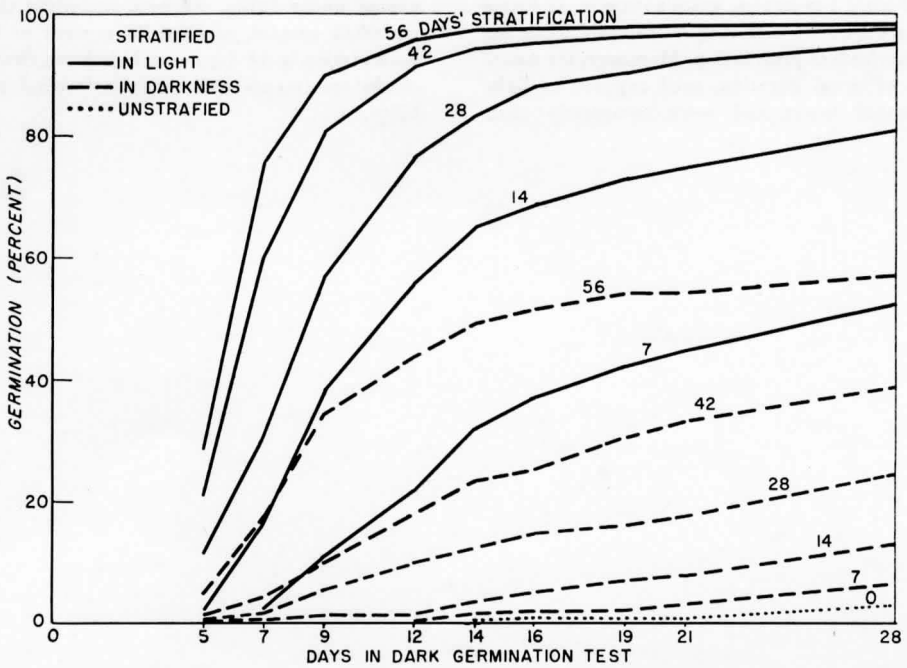

FIGURE 1. *Germination of loblolly pine seed in darkness following stratification for periods from 7 to 56 days.*

water, and potential germination was known to be at least 97 percent.

Eleven treatments were included, consisting of cold stratification for 7, 14, 28, 42, and 56 days in continuous light and in darkness, and an unstratified check. Seeds were stratified and tested for germination in covered boxes made of clear plastic. They were placed on the surface of a thoroughly wet mixture of 1 part sand and 2 parts shredded peat moss, so that those receiving light were fully exposed. Each box held 100 seeds, and there were 4 boxes per treatment.

Seeds to be stratified in darkness were put in black, lightproof, cloth bags. The others were placed under fluorescent lights (two GE T-10J, 40-watt, cool-white tubes) giving 100 footcandles. This light is rich in wavelengths in the region of 6600 Å. All stratification was at 1°C.

Times at which stratification was begun were scheduled so that all treatments were completed on the same day. Boxes of seed stratified in light were then placed in black cloth bags. All lots were kept in bags for 28 days at constant temperature of 22.5°C, to determine germination in dark. No seeds germinated during stratification. Germination counts were made under a 15-watt safe-green light, to which the seed is not responsive.

As Figure 1 indicates, germination in darkness increased directly with length of stratification for both methods of pretreating. Moreover, for treatments of equal duration, seed exposed to light germinated faster and more completely than those stratified in darkness.

The range in germination was 52 to 98 percent for seed stratified in light from 7 to 56 days. By contrast, the range for dark-stratified seed was 8 to 57 percent. When seed was stratified for 28 days in light, 95 percent germinated; double this time in dark stratification gave only 57 percent germination. As unstratified seed germinated only 3 percent in 28 days, pretreatment was beneficial even when done in darkness. Both stratification and light were statistically significant at the 0.01 level. But the best effects were obtained by a combination of the two.

From the final germination percentages in Figure 1, it can be seen that each successive increase in length of stratification, whether in light or darkness, improved germination in darkness. However, the magnitude of these increases diminished as the light-stratification period was lengthened, and became progressively larger for seed stratified in the dark. Stratification apparently removes some of the seed's requirements for light—the longer the stratification, the less light is needed for germination. Hence, by combining light with stratification, light requirements are fulfilled quite rapidly.

Following the 28 days of germination in darkness, all boxes were removed from the bags and placed under lights. All lots, including the unstratified control, reached 95 percent or better germination in 14 days—an indication that none of the treatments had been detrimental to viability.