

year for speculative purposes. We know, fairly well, when next year, or the year after, will not be a good year, based on cyclical patterns or what we have observed in the early, early days of crop forecasting. Therefore, from our inventory, we draw seed for a number of years to fill the needs of our customers who have not taken it upon themselves to keep a sufficient inventory for the lean years.

CONIFER SEED SOURCES, TESTING, STRATIFICATION, AND SOWING FOR THE INDUSTRIAL FORESTRY ASSOCIATION

C.J. SALLY JOHNSON

6511 203rd Ave. S.W.
Centralia, Washington 98531

The Industrial Forestry Association (IFA) is a nonprofit association of companies involved in the timber industry. It was founded in 1934 with the intent of developing an adequate timber supply for the Douglas-fir industry. Towards that end, IFA started its first bare-root nursery in 1941 and has since expanded to three bare-root and one container nurseries that produce approximately 45 million seedlings every year for reforestation. The basic building block for those future trees is, of course, seed.

Seed Sources. The principal timber species grown by the IFA is Douglas-fir (*Pseudotsuga menziesii*). Other conifers of importance are noble fir (*Abies procera*), grand fir, (*Abies grandis*), Sitka spruce (*Picea sitchensis*), western hemlock (*Tsuga heterophylla*) and western red cedar (*Thuja plicata*). These species are grown in areas of the Pacific Northwest primarily west of the Cascade mountains from the Canadian to the California borders.

All contractors belonging to IFA supply their own seed for sowing in the nurseries. This seed is obtained in a variety of ways, including seed companies such as the Brown Seed Company, to mention just one. Some companies collect their own seed and have it extracted by a seed company or they may do their own extraction. Still other companies have developed seed orchards to supply their seed needs with genetically improved seed.

The majority of the seed supplied is identified by seed zone and elevation. A few have divided the designated seed zones into breeding units that reflect a specific microclimatic site. It is important to know the seed origin as this will affect the subsequent performance of that seed.

Seed Testing. IFA requests a seed sample of all lots scheduled to be sown in the fall prior to the spring sowing date. The germination potential of the seed, which includes both the percent germination as well as the speed of germination, is established by means of a soil table test. A standard germination test using the Association of Official Seed Analysts Rules is also done for comparison and for insurance purposes. In addition, the number of seed per pound is established for later use in the sowing formulae calculations. The AOSA testing technique is described in Copeland (1) and will not be discussed here.

The results of the soil table germination tests are used to calculate the operational sowing rates as these results closely approximate field performance. The soil table germination values average 5 to 10% less than the standard germination test values.

The soil table tests consist of sowing stratified seed into fumigated nursery soil in a greenhouse. The soil temperature is approximately 75°F during the day and 65°F at night. The germinates are counted every 7 days for a period of 28 days. We may use various stratification times depending on the origin and past history of the seed lot. All coastal seed zones are tested at both 30 and 60 days of stratification as many of these lots show increased germination with the longer stratification. Some lots have shown increased germination with less than the standard 30 days of stratification.

We are doing some hydrogen peroxide testing on lots that are processed so late in the year that it is impossible to do proper stratification. The hydrogen peroxide test does not require stratification and takes less than two weeks to complete but it does not tell us about the rapidity of germination nor the best stratification time to achieve maximum germination in the shortest amount of time. It is, however, much better than no information at all.

Seed Stratification. The stratification process begins by soaking the seed for 24 hours at approximately 50°F. The seed is rinsed once during this period to remove any foreign material such as soil which may be carrying disease organisms. We have noticed much less mold development on our seed since this rinsing procedure was instigated. At the end of the 24 hour soak, excess water is drained from the seed, and a breather tube is inserted at the top of the plastic bag. Bags containing no more than 5 pounds of seed are hung in a cooler at 34°F for the required stratification time. The seed is checked three times a week and rolled to provide maximum exposure to the air. Water is added if the seed appears to be drying.

Seed Sowing. Once stratification is complete, the seed is surface dried in preparation for sowing. The bareroot nurseries use a "Wind River Seed Drill" to sow the seed in eight equally spaced rows in a 48 in. wide seed bed.

Sowing is scheduled any time after May 1st when the weather permits seed bed preparation. The seed is sown in densities ranging from 20 to 50 seedling per sq. ft. depending upon the fate of the seedling after two years in the seedbeds. Seedlings to be shipped for planting in the field at the end of the two years are grown at the 20 to 30 per sq. ft. densities and the higher density seedlings will be transplanted back into the nursery for another year to obtain larger seedlings that may be necessary in areas where there is high brush competition or heavy big-game browsing.

LITERATURE CITED

1. Copeland, L.O., ed. 1978, Rules for testing seed. *Jour. of Seed Tech.* 3(3):1-126.

TERMINAL BUD ABORTION IN COLORADO BLUE SPRUCE

DAVID G. ADAMS

Oregon State University Extension Service

P.O. Box 1261

Portland, Oregon 97207

Trees of Colorado blue spruce (*Picea pungens* 'Glauca') have for many years exhibited a condition in which the primary terminal bud fails to grow normally in the spring. The severity of the condition also appears to differ from year to year. Since thousands of these trees are propagated and shipped yearly, this malady constitutes a major economic problem to the ornamentals industry of the Pacific Northwest.

Native habitat: The natural range of this tree (1) is from southern New Mexico and Arizona through the Rocky Mountains of Colorado, Utah, Wyoming, eastern Idaho, and possibly southwestern Montana. The trees are usually found in or near stream beds particularly in the more arid areas of its range. It grows at elevations of 6000 to 9000 ft. in the north and 7000 to 10,000 ft. in the southern parts. Soils are often of calcareous nature with a pH of 6.8 to 7.2. As might be expected, mean annual temperatures have an extremely broad range.