Pacific Northwest Tree Improvement Research Coop

BY TOM ADAMS AND THIMMAPPA ANEKONDA

The Pacific Northwest Tree Improvement Research Cooperative (PNWTIRC) conducts research supporting operational tree breeding programs in western Oregon and Washington. Housed in the Department of Forest Science at Oregon State University, the cooperative consists of 23 members from public agencies and private companies in the region.

Currently, the major research emphases of the cooperative are the genetics of cold and drought hardiness and advanced seed orchard methodology in coastal Douglas-fir. Because of the environmental heterogeneity in the Pacific Northwest, it is essential that tree breeders be able to evaluate hardiness of genetically improved varieties so that the varieties that survive and grow best in specific planting environments can be identified and utilized. It is usually not possible to adequately test hardiness to natural cold and drought events in the field because these events occur sporadically, and because it is difficult to separate injury due to cold or drought from other causes.

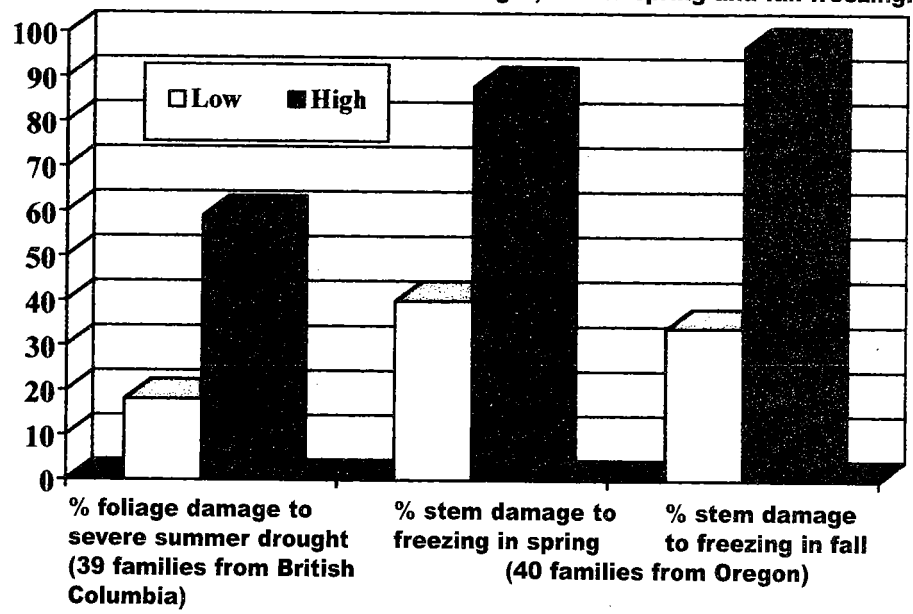
For this reason, we are developing artificial freeze-testing and drought-testing procedures. So far, artificial testing appears quite promising, revealing extensive genetic variation for hardiness traits in Douglas-fir (Figure 1). Thus, there is much potential for improving these traits through breeding. Our methods for assessing hardiness to spring and fall frosts in operational Douglas-fir tree improvement programs will be described in detail in an upcoming issue of the *Western Journal of Applied Forestry.*

Seed orchards are the primary means of producing genetically improved seed for reforestation. In first generation Douglas-fir orchards, trees are planted at wide spacing, are allowed to reach relatively large size, and mating occurs through wind pollination. Although wind-pollinated orchards are an effective and relatively inexpensive means of producing seed, the genetic quality of crops is considerably less than optimal because mating among parents is haphazard and because high proportions (often 40 percent or more) of the seed result from pollination by nearby, non-orchard (unimproved) pollen sources.

One means of achieving better control of mating in the future is to develop miniaturized orchards whereby trees are kept small (2-3 m tall) by aggressive top pruning and crown management, and mating is controlled by artificial pollination. Because trees are small, control of mating and many other orchard practices are more efficient than in traditional wind-pollinated orchards, but effective height management is expensive.

Despite the increased costs, miniaturized orchards are now the standard for radiata pine in New Zealand, but there is little experience with this methodology in Douglas-fir. To assess the value and cost effectiveness of miniaturized orchards in Douglas-fir, the PNWTIRC is establishing a long-term experiment where three alternative miniaturized orchard types will be compared. The results of this study will greatly aid our ability to take full advantage of genetic improvements produced in advanced-generation breeding programs. ◆

Figure 1. Family ranges in mean damage to Douglas-fir seedlings after artificial testing for hardiness to summer drought, and to spring and fall freezing.



Tom Adams is leader and Thimmappa Anekonda is associate director of the PNWTIRC, Department of Forest Science, Oregon State University, Corvallis.