Improving Dormancy Release and Vigour of Abies Lasiocarpa - FRDA Project No. 2.41

PROBLEM:

Subalpine fir is a preferred species on many northern, wet belt and high elevation sites, yet nurseries have not been able to meet the demand for seedlings. Past attempts to produce subalpine fir have been impeded by infrequent cone crops, poor seed quality, low germination, slow seedling growth and insufficient knowledge of cultural requirements.

OBJECTIVE:

Improve nursery production in order to grow high quality subalpine fir seedlings in sufficient numbers to meet reforestation demands.

Specifically:

1) Increase germination and seedling vigour by developing improved methods to break seed dormancy,

2) Determine the optimum conditions for initial establishment and early growth, and

3) Develop a vigour index, based on physiological characteristics such as respiration and seed protein content, to assess seed quality and predict seed performance.

RESULTS TO DATE:

1) Germination and seed health improves when seed moisture is controlled during long stratification.

2) During prolonged chilling high seed moisture is detrimental. High moisture contents result in increased respiration and burning of seed reserves, which otherwise would be available to support germination.

3) Seed protein content is associated with seed quality. Poor quality seeds contain less protein reserves.

STUDY DESIGN:

Carole Leadem, tree physiologist with the Research Branch, Victoria, is applying the stratification-dry-dry technique to subalpine fir seeds based on previous experience with other Abies species.

The stratification-dry-dry procedure, shown to be extremely effective in breaking dormancy of amabilis fir, is initially the same as ordinary stratification. Seeds are soaked for 2 days in water, then chilled at 2-5°C. However, after one month of chilling, the seeds are removed from the cold and dried for 6-8 hours at room temperature to reduce the moisture content to 30%. Seeds are then returned to the cold for 3 more months to complete the dormancy-breaking treatment. In ordinary stratification, Abies seeds are chilled for 2 months without the drying step, so seed moisture remains higher than 40%.

As illustrated (Figure 1), the experiment compared the germination of seeds which were stratified for various times, either with or without moisture control during the chilling period. Seed moisture, respiration, and seed storage protein were measured throughout stratification and germination. These measurements provide an indication of the physiological status of seeds, and how well the seeds respond to treatment.

FIGURE 1. Illustration comparing stratification and germination with and without moisture control.
Responses of three different seed sources to stratification are shown in Figure 2. Dormant lots such as 3714 need long stratification for the best germination. Germination of 3714 was doubled by the stratification-redry treatment. Although nondormant lots such as 3709 do not require prolonged chilling, they are not adversely affected by the stratification-redry procedure. Very poor quality lots (Lot 3711) do not respond well to any type of treatment and should not be used for seedling production.

RESULTS TO COME:

Experiments in 1988/89 will explore the temperature regimes which optimize germination, reduce fungal contamination, and enhance initial seedling growth of subalpine fir.

For further information on this project, contact:

Dr. Carole Leadem
MoFL, Research Branch
Forest Research Laboratory
1320 Glyn Road
Victoria, B.C. V8Z 3A6
(604) 479-7521

RELATED FRDA PROJECTS:

Andrea Eastham, research horticulturist, is working on the growth of subalpine fir seedlings in nurseries. Her studies will address the loss of growth potential due to early budset. For more information on FRDA Project 1.43, Cultural Regimes for Abies lasiocarpa in Northern Latitudes, contact:

Andrea Eastham
Research Horticulturist
MoFL, Research Branch
31 Bastion Square
Victoria, B.C. V8V 3E7
(604) 479-7521