

MODERATOR GRAHAM HART: The next session is on the general subject of seedling production, with Jack Doty the first speaker:

SEEDLING PRODUCTION: *CEDRUS DEODARA*

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Cedrus deodara and its grafted cultivars, are well known for beauty and gracefulness. However, they can be a problem, especially at the seedling level.

Usually, every third year is an excellent seed crop, with a moderate to weak crop in the intervening years. Seed can be stored for up to three years if done properly. Most of our seed comes from Italy; but we do collect some locally when a good crop exists. Seedlings from local seed definitely are not as hardy.

Viable seed can usually be determined by a cut test. Greyish or off color radicals is an indication of bad seed. If this situation exists, a germination test is in order. They germinate quite readily on a wet paper towel on the windowsill.

Our first try at seedling growing over 20 years ago was to produce a two-year liner. At transplanting, mortality was high due to the poor root/top ratio and general sensitivity of the plant. It helps to prune branches and do little or no root pruning before transplanting.

The next approach to the problem was to try to produce a usable 1-year seedling. It is imperative to plant the seed as soon as frost danger is past. Seeds are broadcast, according to cut tests, general inspection of the seed, or a germination test, to produce a density of 30 to 40 seeds per square foot. We use a light sawdust mulch for uniform germination. Once conditions are right, germination will be fast. *Cedrus deodara* seeds need no stratification, other than a two week chill period which seems to speed germination.

Proper nutrients in the soil are important. We do not use slow-release nitrogen. A fast-release nitrogen is used so that we can control growth. Beds are fumigated with a combined mixture of 100 pounds of chloropicrin and 300 pounds of methyl bromide. We like to maintain a pH of 5.5.

Damping-off sometimes is a problem, which we control with routine fungicide sprays. We vary these from time to

time to minimize tolerance to the disease. *Fusarium* comes in the warmer months when the roots are down in the soil. Along with spraying, we try to keep the surface ½ inch of soil on the dry side and avoid plant stress.

When the seedlings are well established and summer temperatures are prevailing it is time for the big push. Now it is important to never stop growth. We constantly monitor soil moisture and have a routine foliar feeding schedule, where we now can control the nitrogen for later hardening-off. Water can be a problem in our area and we sometimes get rain in the early fall when we don't want it. So, we have to rely on other means to harden-off.

Our foliar feeding is continued into the fall with a mixture lacking nitrogen, to encourage bud set. Most of the nitrogen will have been leached out by irrigation and spring rains. Bear in mind that we try to extend our growing season to its fullest length and then use an accelerated program for hardening-off. Wrenching is another means by which we can further increase the dormancy factor. After the seedlings are beginning to go into dormancy, an undercutting blade is pulled through the beds, on or below the root tips, and at a slight angle. This disturbs the soil and sends the plants into further dormancy. Basically, what we are trying to do is to use all things at our disposal to slowly stress the seedlings to a dormant condition in preparation for lifting.

Lifting time is very important. We have found December 1, give or take two weeks to be the best for our area. I understand that there is no reliable test on conifers to determine dormancy. One needs to go back and monitor the temperature and conditions for the nursery. Even the record hot spell we had this year may have had a bearing on determining the optimum lifting time.

Keep in mind that the plants are not completely dormant at lifting time, but they are close, and will become dormant after storage. If we wait until after the first of the year, we are taking a chance on freeze damage.

Cedrus deodara seedlings definitely do not fall in the Zone 6 hardiness class, as does a mature plant. I can relate this to the big freeze we had some years back, when rhododendrons in the ground were killed, whereas the same cultivars that had been balled out earlier and subjected to the same conditions did not die. In other words they were shocked or stressed into dormancy.

It is important to minimize lifting to cooler time. We really do not want to stress the seedlings any more than we have to. Roots should be kept moist, but not overly wet. Tops are kept

dry at all times during processing, as well as while lifting. We like to pull the seedlings on a cloudy day; 20 minutes of exposure to the sun's rays is disastrous.

Storage brings up another problem. We used to root-wrap the seedlings in plastic. Latest indications are that a bare-root, loose pack, air circulated storage in polyethylene bags is the best, (and without too much moisture). *Botrytis* is our biggest enemy in storage. We used to dip the tops in fungicide but now we spray in the fields just prior to lifting. Storage temperatures are just above freezing. We have successfully stored *C. deodara* seedlings for three months by this method.

We feel it is very important that the customer know how to take care of the stock when he receives it — and to know when it is coming. Care instructions are enclosed for new customers, along with notification of the shipment.

A few months after shipping, we send a questionnaire to selected customers for comments. Returns are usually low, but they are effective. There always seems to be need for improvement.

Through the years, while working with *Cedrus deodara*, I think we have learned some basics which we can apply to our other seedlings, to a greater or lesser degree, depending upon the cultivar. They are:

1. Be in control of plant growth at all times.
2. Do not dig until ready.
3. Minimize shock at harvest time.
4. Instruct customers as to proper care after receiving the stock.
5. Give customers a chance to let you know if they have any problems.

DOUGLAS FIR CULTIVAR IMPROVEMENT PROGRAMS

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In British Columbia, where fifty cents in every dollar earned is said to come directly or indirectly from the forest industry, the raw materials for that industry, the trees on the hillsides, represent a truly enormous investment. Farmers and horticulturists have for centuries used both intensive management and genetic improvement to increase their yields, and foresters are now having to apply the same principles and