FOREST RESEARCH LABORATORY
RESEARCH NOTE 63

testing the vigor of coniferous planting stock

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Successful establishment of plantations depends largely upon the availability of vigorous seedlings and sound outplanting practices. Recent studies of seedling physiology have resulted in greatly improved nursery and planting procedures. However, to prevent costly losses, the physiological quality of seedlings still must be tested before outplanting because appearance seldom reliably indicates potential survival and growth. Perhaps even more important, such testing will pinpoint whether subsequent unsatisfactory growth stemmed from nursery or field practices, thus allowing for quick remedy in future operations.

We describe a test procedure developed during growth room and field trials for which we processed hundreds of test lots of seedlings, mainly Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*), as well as lodgepole pine (*Pinus contorta*), Jeffrey pine (*Pinus jeffreyi*), and Sitka spruce (*Picea sitchensis*), noble fir (*Abies procera*), and western larch (*Larix occidentalis*). If done properly, this simple procedure will closely estimate the physiological vigor of planting stock..

facilities

The test involves maintaining seedlings under constant conditions and observing bud flush and survival. A growth room permits control of temperature and light, but a glass house or a well-ventilated room can be used (1) if temperatures can be maintained at 68° F to 75° F, and (2) if a bank of fluorescent lights with a time clock can provide a regular photoperiod.

The physiological quality of seedlings will become apparent more quickly if the seedlings are stressed, which requires a facility with controlled temperature and humidity. A small chamber holding 10 to 30 seedlings will be large enough, but the small units available commercially are expensive.

the initial tests

As soon as possible after a lot is received from the nursery, 50 to 60 seedlings should be randomly selected, immediately potted, and held in the growth room or equivalent. Any delay in sampling means that tracing the actual source of problems with planting stock will be difficult, if not impossible. If any seedlings must be cold-stored for more than 2 weeks before outplanting, more trees should be sampled after storage.

If seedlings are to be stressed, the sample of 60 seedlings should be divided into two sublots of 30 plants, one to be stressed and the other as a control. The most common stress treatment is to expose the bare roots and shoots to 90° F and a relative humidity of 30 percent for 15 minutes just before potting the seedlings. However, the stress treatment may be lengthened or shortened depending on the relative severity of the intended planting sites.

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Then seedlings should be potted in a forest soil to minimize contamination with pathogens. A 3-gallon container easily holds 10 seedlings without crowding. A wood ring with notches will hold seedlings during potting (Fig. 1) so roots do not bend. Cans should be labeled with the seed lot, potting date, and type of treatment (stressed or unstressed). All seedlings should be watered immediately after potting.

For 4 weeks, the potted seedlings should be watered weekly and maintained at 70° F (fluctuation should not exceed ± 5° F) with a 16-hour photoperiod of ≥ 500 footcandles. If light intensity decreases, replace the light tubes. After 4 weeks, bud flush and survival will indicate the vigor of most trees; however, 6 weeks of observations may be necessary for seedlings lifted before December because they will respond more slowly than those lifted in winter.

In good lots, flushing is uniform and rapid, with most trees breaking bud within a week of each other. The lots with intermediate vigor are more difficult to judge (Table 1).

field observations

To determine if the regeneration chain has weak links or if the initial testing procedure must be adjusted, survival in the field should be monitored on 50 trees planted in an area representative of the outplanting area of a given lot.

If a lot satisfactory in the initial test has poor field survival, the seedlings probably were mishandled during storage, transport, or actual planting. But if survival in the field is significantly better than in the growth room, the test procedure probably was faulty—a poorly chosen or mislabeled sample, careless handling during potting, or stress too long relative to the prospective planting site. Low survival in the growth room followed by low field survival means the problems originated in the nursery that shipped the seedlings.

Table 1.

CHARACTERISTICS INDICATING SEEDLING VIGOR.

Predicted field survival	Survival (%) in growth room		Days to bud break[a]	
	Not stressed	Stressed	Not stresed	Stressed
Good	95	90	25	32
Moderate	85-95	75-90	25-35	32-45
Poor	85	75	35	45

[a] Add 5-10 days for seedlings lifted before mid-December.

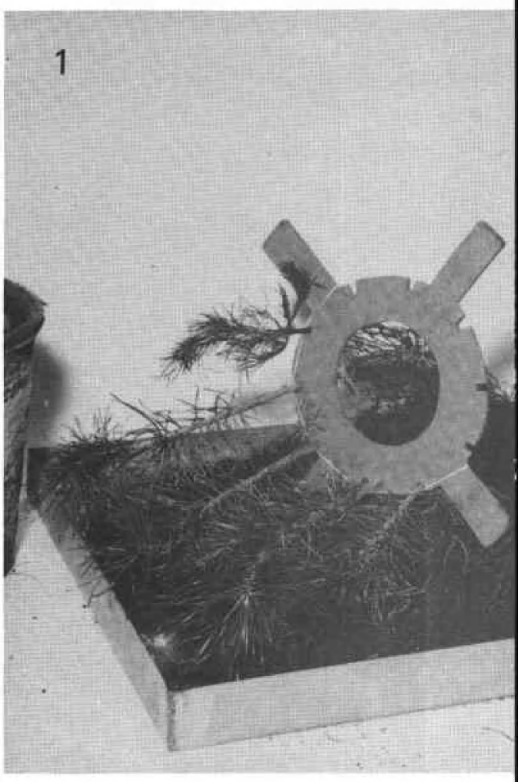

Figure 1.

Step-by-step procedure for potting test seedlings: (1) loading seedlings into the notched ring; (2) loaded ring (10 seedlings) and properly labeled pot; (3) ring properly

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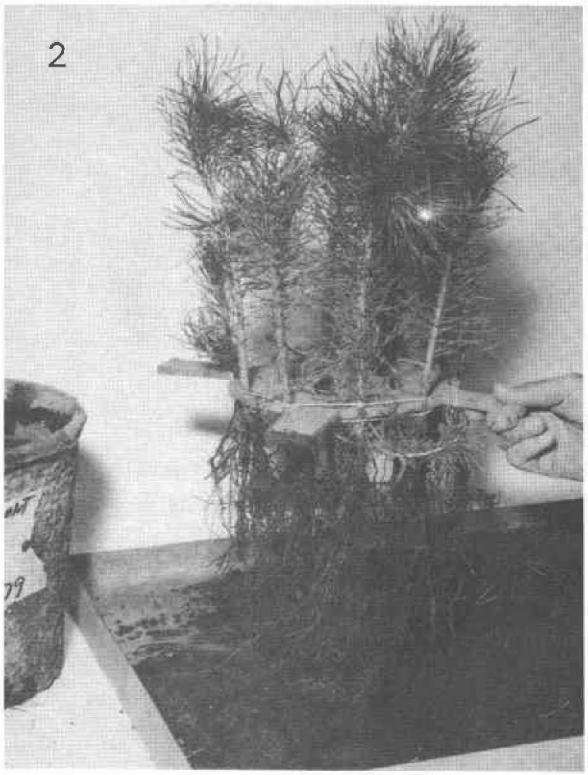

positioned so seedling roots will not bend; (4) pot ready for addition of soil; (5) adding soil through the center hole of the ring; and (6) soil tapped down, potting completed.

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