Peat proves superior medium for Douglas-fir seedling growth

James W. **Edgren,**
Plant Ecologist
Pacific Northwest Forest and Range Experiment Station USDA, Forest Service

Douglas-fir seedlings were grown for 30 days in Jiffy-7 pellets, Jiffy-7 peat, and nursery soil. One might expect seedlings to grow better in peat than soil, but the difference proved far greater than expected.

Jiffy-7 pellets, small disks of shredded compressed peat, expand from 8 by 47 millimeters when dry to approximately 50 by 47 millimeters when wet. After expansion, the center hole in which a seed or seedling is planted is about 20 millimeters in diameter and varies from 5 to 10 millimeters in depth. The pellets were used in this experiment both intact and as loosened peat crumbled into small pleated paper drinking cups the same size as the expanded pellets (fig. 1) .

The soil used was Stabler shotty loam [1] taken from the USDA Forest Service's Wind River Nursery near Carson, Wash. This river terrace soil is medium granular in structure and well drained. Parent materials include basalt, sandstone,

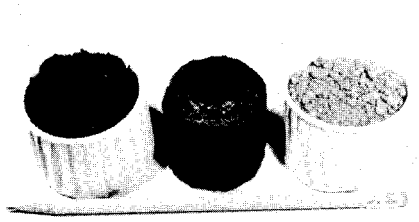

Figure 1.-Douglas-fir seedlings were grown in, left to right, crumbled peat, ex panded Jiffy-7 pellets, and soil.

shale, anti pumice. The same type of cup used for crumbled peat was used as soil containers.

Procedure

Douglas-fir seeds were germinated at room temperature on blotters in a closed plastic box. As seeds germinated, they were planted singly in 40 sets of pots. Each set contained one expanded jiffy-7 pellet, one cup filled with jiffy-7 media, and another cup filled with soil. Seedlings planted in each set of three were matched for radicle length. Three days lapsed from start of germination until 40 suitable sets of seedlings were produced.

Seedlings were grown for 1 month in a Percival Environator programed for 16-hour, 80° F. days at approximately 1,500 foot-candles illumination and for 8-hour, 50° F. nights. Pellets and cups were placed randomly on metal grating in the environator. Seedlings were watered when jiffy-7 pellets began to appear dry, every second or third day. On this schedule, cups containing soil were probably watered more often than necessary. However, cups were provided with four drain holes each so that drainage from soil, though slower than from pellets or cups with peat, was adequate.

No fertilizer was added to either soil or peat. Jiffy-7 peat pellets are fertilized during manufacture and the nursery soil is fertilized regularly. The intent was to test these media as they existed.

After 18 days' growth, length of all cotyledons was measured to the nearest millimeter. One month after planting, each seedling/was carefully washed from its container, and length of all lateral roots was measured and totaled. Seedlings were then dried to constant weight at 70° C. in a NAPCO double oven.

1 Anderson, A. C., Merrill Kunkle, F. E. Schlots, and others, 1956. Soil survey of Skamania County, Washington. USDA Soil Conserv. Serv. Scr. 1940, No. 20, 92 p., illus.

Results

During the 30-day course of the study, 11 of the 120 seedlings died. Six were in jiffy-7 pellets, two in cups containing peat, and three in soil.

Of 40 seedlings in soil, 19 still retained their seedcoats 11 days after potting. Corresponding numbers for jiffy-7 pellets and peat in cups were five and seven, respectively.

Only those 26 sets of seedlings without mortality were included in statistical analyses of growth data. Orthogonal comparisons revealed that cotyledon length, total length of lateral roots, and ovendry weight were affected by the rooting medium. Growth differences between peat and soil were highly significant:

	Cotyledon length	Total length of lateral roots	Ovendry weight
	mm	mm	mm
Jiffy-7 pellet	21.2	90.4	30.2
Peat in cup	21.7	83.5	33.6
Soil in cup	16.1	4.5	15.9

Cotyledon length and ovendry weight were approximately 33 and 100 percent greater, respectively, in peat than in soil. Lateral root length differences were even more startling. Total length of lateral roots per seedling in soil was only one-twentieth that in jiffy-7 pellets and one-nineteenth that of crumbled peat.

Seedling growth in peat was not significantly different between pellets and cups. Cotyledon lengths for seedlings grown in jiffy-7 pellets and cups of peat were nearly identical. Seedling dry weight averaged numerically greater in cups and lateral root length greater in jiffy-7 pellets.

Discussion

The peat contained in the jiffy7 pellet is obviously an excellent medium for plant growth. Stabler soil is markedly inferior to jiffy-7 peat as a growth medium. Relatively high mortality of plants growing in ‚Jiffy-7 pellets can possibly be explained by the difficulty of keeping these bare cylinders of peat moist. In the growth chamber, they tended to dry out overnight and certainly became quite dry over a weekend. Conversely, potted soil drained more slowly, and survival did not appear to be affected as much. Peat in cups drained well and (lid not appear to dry as rapidly as in jiffy-7 pellets.

First evidence of growth differences was provided by the length of time seedcoats were retained by seedlings. Though this factor might seem insignificant, it bears direct relationship to the length of time succulent tissues are susceptible to *Fusarium* spp. and other agents causing damping-off in nursery beds. Rapid shedding of seedcoats also shortens the time during which
birds are most attracted to newly germinated seedlings.

Lateral roots were more numerous on seedlings growing in peat than on those growing in soil. This fact has particularly significant implications for nursery culture - addition of peat in large quantities to nursery soil may cause seedlings to produce a greater number of lateral roots. A more favorable toproot relationship after lifting might result because a greater amount of the total root material produced would be retained by the seedling, rather than lost through breakage
of a few long laterals.

The few laterals growing in soil were short. Individuals were rarely more than 1 centimeter long. Those growing in peat frequently extended to the perimeter of the peat pellet or cup. If the pellets and cups had been larger in diameter, differences in total lateral root length probably would have been greater yet.

Study results also suggest that a high percentage of peat would be advantageous for producing Douglas-fir in containers. Use of peat would reduce container weight and improve rooting conditions. Further, when researchers do studies with potted Douglas-firs, they should consider use of peat or a peat-soil mixture instead of soil for the potting medium. Differences caused by treatments are more apt to be detectable and significant when the maximum growth potential of a species is approached.