

field. What has your experience been?

LEN SAVELLA: We have been growing pink dogwoods this way for 18 years and have never had any problems

PETER VERMEULEN: I notice you are using clay pots and not plastic. Do you have any comments?

LEN SAVELLA: I find that if I put them in plastic pots they dry out faster. They stay wetter in clay pots under the sand and need only 1 or 2 waterings during the winter.

MICHAEL DIRR: Have you tried *Cornus kousa*?

LEN SAVELLA: Yes They work equally well under this same conditions.

PROPAGATION AND GROWTH OF FRASER FIR

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Fraser fir (*Abies fraseri*) is a handsome forest tree localized to high elevations (>4000 ft.) of Virginia, West Virginia, Tennessee, and North Carolina. Its name was given in honor of Fraser who introduced it into England in 1811. The Fraser fir is very closely related to the balsam fir. (*A. balsamea*) and probably originated as a relic community of the balsam fir following glacial retreat (1)

The differences between the balsam fir and the Fraser fir are subtle. The botanical separation is based primarily upon differences in the cone structure. Under close observation the Fraser fir appears to have greater needle density, better color, and more wax on the buds and leaves. It is these qualities that make it a highly prized Christmas tree species. The Fraser fir also begins growth later in the spring which makes it less likely to be injured by frost. These attributes make Fraser fir a highly prized Christmas tree species which will command higher prices than good quality pine or spruce. The annual harvest of Fraser fir Christmas trees now exceeds \$10,000,000. Demand for the trees greatly exceeds the supply and there is much interest in increased production in North Carolina, and Virginia.

The hindrance to increased Fraser fir Christmas tree production is the lack of planting stock. Seedling growth is slow and 5 years are usually required to produce a suitable field transplant. There is insufficient information on the proper methods for seed-

ling production. Some growers are now successfully producing seedlings but still have only partial knowledge of precise growth requirements.

The increased demand for planting stock has also created a shortage of seed. The native stands in Virginia and North Carolina have been the primary source of seed. Much of this area has now been purchased by the Department of Interior for preservation as a "wilderness" area, which prevents further seed collection. However, through the group efforts of a Fraser Fir Advisory Committee composed of representatives from the Virginia and North Carolina Cooperative Extension Services, Divisions of Forestry and Christmas Tree Growers Associations, plans are being formulated to allow limited seed collection from the Federally owned land. These efforts should supply the short term need for seed.

The long term solution to the seed availability problem is to establish a Fraser fir seed production area. Through the efforts of the Advisory Committee and funding by the Tennessee Valley Authority a seed production area is being established. The first stage was completed in the spring of 1980 when 200 select trees from grower plantations were moved to a desirable site in the Grayson Highlands State Park, Grayson County, Va. This area is located within the confines of the native Fraser fir stands. Additional trees will be moved from "wilderness" areas in 1981. The trees moved to the site are in the 4 to 5' range and it is expected that it will be 10 to 15 years before significant quantities of seed can be produced.

In view of the limitations set by the current seed supply, it is essential that efforts be made to maximize the harvest of seedlings from a given seed lot. There is also need to research ways of reducing the 5 years required to produce seedlings and to explore alternative methods of planting stock production. North Carolina researchers are engaged in a major research program to study various Fraser fir problems. Virginia research efforts are on a more modest scale and basically cover 3 areas: a) to determine if Fraser fir would respond to accelerated growth techniques; b) to study the effect of shading, soil modification, and fertility on transplant production; and c) to survey field production sites in Virginia to determine if tree vigor could be correlated with elevation, exposure, soil type, organic matter, or soil fertility.

The first phase was accomplished using accelerated growth techniques patterned after those used by Michigan State researchers and discussed by John Hart of Michigan State before this group last year (2,3). Seedling plants germinated in September were grown in the greenhouse until February. At this time the small dormant plants were placed in a lighted growth chamber at 46°F. Plants were removed from the growth chamber after

2, 4, 6, and 8 weeks and transferred to the greenhouse for observation. Following 4 or more weeks of cold treatment the buds broke dormancy and produced another flush of growth. The amount of ensuing growth was related to fertility level before the chilling began. A maximum response was obtained when the plants were supplied with 400 ppm of N in the NH_4NO_3 form. Although not part of this experiment, a separate group of 2 year old seedlings held in the dark at 40° for 6 weeks also broke dormancy and produced a normal flush of growth when field planted.

The second phase dealing with transplant production in field beds was initiated in 1980 and will not be evaluated until 1981.

The third phase dealt with the evaluation of 41 plantings of Fraser fir in a 6 county area of southwest Virginia to determine what constitutes a good planting site. Collection data included elevation, exposure, soil type, organic matter, pH, CaO, MgO, P_2O_5 , and K_2O . This survey revealed good growth of Fraser fir plantings at elevations ranging from 1500 to 4000 ft. at pH levels ranging from 4.6 to 6.5 at organic matter contents ranging from 1.5 to 10.3% and at Ca, Mg, P, and K levels ranging from low to high. These results still do not allow us to define the requirements of a site which provides good growth potential for Fraser fir. It seems that a combination of factors are involved. Elevation and soil type are probably the prime considerations. At lower elevations, soil requirements probably become more exacting.

Conclusions: The Fraser fir has great potential for increased Christmas tree production if planting stock can be supplied. Fraser fir lends itself to accelerated growth techniques. There is considerable need for information on alternated methods of propagation such as rooting of cuttings, tissue culture, etc.

LITERATURE CITED

- 1 Schopmeyer, C S 1974 Seeds of Woody Plants in The United States, Agr. Handbook No 450
- 2 Hanover, J W, E Young, W A Lemmien, and M VanSlutten 1976 Accelerated-Optimal Growth A new concept in tree production Res Report 317 Michigan State University
- 3 Hart, J W and J W Hanover, 1979 Practical requirements for controlled environment nursery stock production *Proc Inter Plant Prop Soc* 28 139-155