

seedlings will be distributed to nurseries throughout the area and evaluated yearly. Problems of this type often require diligent effort by growers and researchers alike.

LITERATURE CITED

1. Fechner, Gilbert, Colorado State University, Fort Collins, Colorado (Personal communication).

IMPORTANCE OF SEED SELECTION FOR CHRISTMAS TREE PRODUCTION

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Equally as important to successful Christmas tree growers as it is to the timber industry is the selection of seed for plantation Christmas trees.

In the early days of Christmas tree farming, in the early 1960's, growers began to see a marked difference among trees with seed origin from different geographic areas.

This prompted provenance tests using the most popular Christmas tree species, namely *Pseudotsuga menziesii*, (Douglas-fir), *Abies procera* (noble fir), *Abies grandis* (grand fir), *Abies magnifica* var. *shastensis* (Shasta fir), *Pinus contorta* (shore pine), and *Pinus nigra* (Austrian pine).

These provenance tests were laid out, managed, and evaluated by member growers of the Northwest Christmas Tree Association, in conjunction with Oregon State University, United States Forest Service, Oregon State Department of Forestry, and Washington State Department of Natural Resources.

These provenance tests were established from northern Washington to southern Oregon to give a wide range of climatic conditions as well as inherited traits in selected sources.

Trees were evaluated for color, branch arrangement, number of buds, disease resistance, climate adaptability, form and most important, overall development rate. After all, Christmas trees are intended to be a crop to make money. The quicker the turn-over in a marketable tree the better.

For **color**, customers always prefer a dark green to blue green. A golden color is accepted in the nursery industry but not in Christmas trees.

Branch arrangement and number determine the density of the tree. Five generally gives a good tree. More is better, of course. Slightly upright branches are desirable.

Disease resistance is a major influencing factor. Trees are taken from wide ranges, so naturally developed immunities in native stands are not helpful. Some trees show more tolerance than others to naturally occurring pests.

Climate adaptability: time of bud break seems to be the most important factor. Late bud break is not as subject to freezing or insect and disease infestation as early bud break. Trees are most vulnerable to insect and disease attacks when they are succulent. Late bud break time could by-pass some of these problems.

Form: the slim, tapered, pyramid is the shape everyone wants at Christmas. Shape can be altered by means of shearing, a common practice for Douglas-fir and pines. The true firs are naturally inclined to slim tapers but some sources lend themselves to shearing and shaping better than others.

Development rate has to be the most important factor. No matter how good color, branch arrangement, disease resistance, climatic adaptability and form is, if it takes a long rotation to get a good 5 to 8 ft. tree it is not economical to use that particular seed source.

All these tests paved paths for seed collections from specific areas for propagation by nurseries.

Those geographic areas chosen as the better seed sources are:

Douglas-fir — the eastern portion of Vancouver Island, Canada, at elevations above 500 feet; the area around Shelton, Washington; Cushman Lake; and areas west of Corvallis, Oregon.

Noble fir — areas around Mt. St. Helens in Washington; the mid-Oregon Coastal Mountains, with one very specific region known as Mary's Peak, the highest peak in the Oregon Coast Range. This area has qualities not exhibited in the general Coast Range.

Grand fir — the Clearwater River drainage area in Idaho was chosen as the single best source for its needle holding qualities. The grand fir has always been a notorious needle dropper.

Shasta fir — generally the area west of Grant's Pass, Oregon proved best.

Shore pine — the Southern Oregon Coast outrated areas farther north for color and density.

Austrian pine — Russia, Yugoslavia, Turkey, and Spain rated best for color, needle length, number of buds, vigor and shearing response.

The areas mentioned received the best evaluations. There are other general areas which growers on their own have chosen for not only the earlier mentioned qualities, but for their own personal reasons. Some growers disregard all the tests and choose a single tree or an area of trees for their own planting stock. Seed is usually picked by them, cleaned, and furnished to growers like ourselves to be custom grown.

In conclusion, these tests help us as propagators choose generally accepted superior Christmas tree areas for our seed. It costs no more to plant superior seed with desirable inherited traits, so why not do so.

VOICE: In soaking the seeds, how long a soaking period do you use?

CLARK BROWN: It is the cones we are soaking prior to drying. We soak them from 15 to 30 minutes.

ED SCHULTZ: Sally Johnson, have you used the insecticide, Mesurol, to keep the birds off your pine seedlings. It is reported to have some repellent properties.

SALLY JOHNSON: No, we have not used it for this purpose. I don't believe it has a legal registration for this use.

BEVERLY GREENWELL: Dave Adams, have you considered boron deficiency as a possible cause for terminal bud abortion in the Colorado blue spruce?

DAVE ADAMS: We have not ruled it out, but in areas where we have made tests there is adequate soil boron for most trees.

BEVERLY GREENWELL: In British Columbia we have had this problem consistently for a number of years and we have noted both low boron and low calcium in these areas. Boron applications seemed to help after 3 or 4 years.

DAVE ADAMS: In Colorado they are running a series of tests, including soil tests, on this problem so more information may be available in another year.

BEVERLY GREENWELL: When you supply conifer seed to seedling growers do you also supply information on the seed source — the provenance?

CLARK BROWN: Yes, we always give information on the seed origin — seed zone, elevation, crop year, and sometimes the specific stand.

BEVERLY GREENWELL: Then how does it happen that so many seed dealers do not know where their seeds came from?

CLARK BROWN: This is a big problem, but basically it is probably because some dealers do not keep sufficient records.

WILBUR BLUHM: In regard to the boron relationship to bud abortion in Colorado blue spruce, in tests I have been involved with we could find no correlation between boron levels and bud abortion.

VOICE: Does Clark Brown's company use X-ray examination to determine the condition of his seed.

CLARK BROWN: No, we do not. We depend only on visual examination and on cut tests.

STRAWDUST — AN ALTERNATIVE GROWING MEDIUM

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Because of the diminishing supply and increasing cost of barkdust and sawdust which we were using in our nursery, we have developed an alternative container medium, using materials which are locally available in abundant supply.

This new medium is made from wheat straw that is resin-impregnated in a special treatment process. Treatment of the straw is necessary because straw normally decomposes rapidly, and requires large amounts of nitrogen when it does. It also shrinks rapidly and is full of seeds.

The treatment process is as follows:

1. Bales of straw are placed in a tub grinder which rotates and feeds the straw to a hammer mill.

2. The straw is then conveyed to a mixing auger where the first set of chemicals are injected.

3. This mixture is then augered to the next machine where the second set of chemicals are sprayed on the straw. It is then augered to the cube dies where it is extruded into blocks. The extreme pressure of this extrusion process forces the chemicals into the straw and also compresses the straw so there will be little shrinkage later. The heat generated by extrusion of the straw and chemical mixture kills all seeds that may have been present and sterilizes the material.