GERMINATION AND DENSITIES

by

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This subject has been given formal presentation on more than one occasion at our meetings and, no doubt, has entered somewhere into discussions at most of them. Although on the surface it may appear to be nothing more than a simple mathematical. calculation, we all know that there is much more to it than that We have all had our problems in arriving at the correct densities in our seedbeds, and I doubt if many of us have the problem entirely licked even at this late date. I know we in British Columbia haven't. However, we have improved our techniques at least to the point that we are having fewer calamities than in earlier years.

We feel that we haven't much to offer in way of improved methods and what I have to say will merely introduce the subject and I hope stimulate some good discussion.

No doubt we all have our own ideas as to the density at which the trees should be grown to produce a maximum number of plantable trees of the size and quality required.

We know that the size of stock and perhaps to a lesser degree its overall quality can be controlled by sowing densities. Much of the waste through culling and the inferior quality of stock can be attributed to high seedbed densities, On the other hand, there are limits to which we can lower our densities and still have an economical operation. In this regard it might be well at times to ask ourselves the question: "When does quality became a luxury?" It is a waste to produce stock at 25 per sq. ft if stock of acceptable size and quality can be produced at 40 per sq. ft, just as it is a waste to plant transplant stock When 2-0 will give adequate performance.

Some data gathered from an experiment conducted by our Research Division illustrates the effects of seedbed density on Douglas fir stock (see attached table.) A study of these figures indicates that our present practice of sowing Douglas fir to anticipate a density of 40 trees per sq. ft. at the end of the first growing season efficiently utilizes both nursery space and seed supply as well ac to produce stock of good quality.

We would not suggest that all stock be grown. at this density since the requirements of size and quality of stock may vary and growing conditions in one nursery may allow for greater densities or demand lower densities than in another. We do feel, however, that there is little need to move very far in either direction to get an adequate response.

Once we decide on the density that we desire the problem is to attain these densities in our seedbeds, One factor that is sometimes overlooked is that, in considering densities, we must take into account the culls as well as the plantable stock produced. In other words, 'with a. density of 40 trees per sq. ft we cannot expect to obtain 40 trees of plantable

quality. In order to do this we would have to sow at a higher density which again would increase our cull. factor. So in speaking of a density of 40 per aq. ft. we are not thinking in terms of plantable trees. This percentage of cull then becomes a very important factor to be considered if we are going to end up with the number of plantable trees required.

To aid us in predicting tree percentages we compiled data concerning the 1-0 inventories and the number of plantable trees produced from a large number of seed lots over a period of ten years in 3 different nurseries, and, to our surprise, we found that on the average there was a 37% loss between 1-0 inventories and plantable 2-0 stock. Applying this factor then we can only expect to get about 25 trees per sq. ft, from a total density of 40 trees per sq. ft. Through improved growing techniques we have been able to improve somewhat on this ten year average but are only still obtaining about 30 trees from a sowing rate of 40 per sq. ft.

Since we are not discussing germination tests we will assume that the germination percent is a true indication of the number of viable seeds sown but again another factor has to be considered and that is the difference between the number of viable seeds sown and the field germination obtained.

To arrive at a factor, a summary of data for each nursery was compiled and expressed in terms of the number of viable seeds sown in relation to the number of 1-0 plants obtained. For sowing rate calculations the summarized data are converted to our standard 183 sq. ft. seedbed. Yearly checks are made and when thought necessary the sowing densities are revised. This happens as nursery techniques improve. Extra beds are always sown to take care of contingencies,

As an example of the above; at cur Green Timbers Nursery it has been found that under present conditions 8,400 viable seeds should be sown on each 50 ft. seedbed (1.83 sq. ft.) to produce 40 seedlings per sq. ft. (7300 per bed) which in turn will produce in the neighborhood of 5500 plantable trees.

Our germination tests tell us the number of viable seeds per gram which figure, if divided. into 8,400, will indicate the number of grams of seed required per bed.

The number of viable seeds required to produce a given density will vary between nurseries - at the Duncan Nursery 9500 seeds are required compared to 8400 at Green Timbers.

From the foregoing it will be realized that our figure of 40 trees per sq. ft, does not mean too much but merely acts as an interim objective or a point of commencement and has little relationship to the number of trees produced.

If we are concerned more with the quality of stock rather than just numbers of trees, then we will agree that we are better to have understocked beds rather than overstocked, and we can't have overstocked beds if we don't put the seed in the ground. For that reason we are better to err on the light side rather than take a chance on overstocking with the resulting loss in quality and waste of seed.

Yield and Morphology of Seedlings

in Relation to Sowing Density

(Douglas fir)

Sowing Rates No. viable Seeds Sown/sq.ft.	11.5	35.1	58.8	82.4	106.5
1-0 Density	11.0	30.3	50.1	62.2	83.5
2-0 Density	8.5	27.5	47.0	60.2	80.1
1-0 Density as % of Viable Seed Sown	95.6	86.3	85.2	75.5	78.4
Yield of Plantable Trees	7.4	20.3	30.2	37.5	41.9
Plantable Trees as % Of viable Seed Sown	64.3	58.0	51.3	45.5	39.4
Cull Trees as % of 2-0 Inventory	12.9	26.2	35.7	37.7	47.7
Cull Trees as % of 1-0 Inventory	32.7	33.0	39.7	39.6	50.0
Length of Top (cm)	20.6	22.2	21.7	22.2	22.4
Length of Root (cm)	18.0	15.8	15.2	14.2	13.9
Root Volume (mls)	4.81	2.60	2.23	1.82	1.58
Average Stem Diameter (mm) 1 cm. above root collar (Plantables Only)	3.80	3.23	3.00	2.85	2.70

DISCUSSION

Q: The number of square feet that the number of trees were grown on that you talked about on the chart?

A: 8 square feet.

Q: Was fertilizer varied across the bed?

A: It was the same all the way across

Q: You have averages over a number of years, but from year to year, you get a lot of variation?

A: Yes, it's true you get variation.