A Comparison of Nursery Sowers

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Three nursery sowers were evaluated and compared for precision of seed placement and production of plantable seedlings. A vacuum-drum sower produced in New Zealand gave the most precise seed placement and the lowest percentage of cull seedlings.

Seedbed density in the nursery is a measure of the average number of seeds or seedlings per given area. Seedbed density is important in growing quality seedlings, so that as many seedlings as possible actually have the optimal space they need. In other words, the distribution of spacings is as important as the average. A good distribution would be a narrow bell-shaped curve that peaks at the desired seed spacing. An undesirable distribution would be one that is more spread out or skewed to one side of the mean.

Most forest tree nurseries in the southern pine region employ either a Whitfield or a Love-Oyjord sower (1). Weyerhaeuser Company currently sows all seed in its southern nurseries with a company-developed vacuum sower. The Love Company plans to market this sower, which is designed to precisely place individual seeds. A vacuum-drum precision sower developed in New Zealand by Summit Equipment Ltd. is also being marketed in the United States. The objective of this study was to compare the Whitfield, Love-Oyjord, and Summit sowers for seed spacing distributions and seedling production and morphology.

Materials and Methods

Seed spacing study. Each sower was calibrated to sow approximately 320 seeds per square meter in 8 rows and was operated for approximately 8 meters. For each sower, the interseed distances in each of the eight rows were measured for a distance of 0.6 meter for each of five random samples. Data for the five samples were combined, and a histogram was drawn for each sower to show the distribution of seed spacing (figs. 1-3). The average interseed distance is marked on each histogram. Any interseed distance less than half this value was referred to as a *double;* any distance from 2 to 1-1/2 times the average was a *single;* any space greater than a single was called a *blank.*

Nursery study. The sowers were calibrated as above and used to sow four replications of the same seed source on 1.2-meter-wide rows in the nursery. At the end of the growing season, seedlings from each sower-area in twenty 0.37-square-meter samples were dug up and graded.

Results and Discussion

The Summit sower produced the most precise seed placement of the three sowers. Its distribution of seed spacings most closely resembled a bell-shaped curve with a peak near the desired spacing. It also had the highest proportion of singles, the lowest proportion of doubles, and the lowest variability among the separate rows in number of seeds per row (table 1). Both the Whitfield and Love-Oyjord sowers gave high proportions of doubles, had variable spacing, and

varied in the number of seeds per row. All three sowers gave about the same proportion of blanks, but the Whitfield and Love-Oyjord sowers tended to leave longer empty spaces. (Figs. 1-3).

Table 1- Summary of seed spacing study

	Summit	Love-Oyjord	Whitfield
Doubles (%)	28.4b	47.2a	48.7a
Singles(%)	49.5a	28.5b	27.5a
Blanks(%)	22.1a	24.2a	23.5a
Sowing density (#/m^2)	340.9a	317.0b	294.9c
Coefficient of variation of interseed distance	75.4	130.3	133.0
Range of seeds per meter among rows (difference)	49.3-55.7 (6.4)	41.7-57.7 (16.0)	40.7-53.0 (12.3)
Coefficient of variation of seeds per row	4.7	9.3	10.3
Tractor speed (km/hr)	1.1	3.2	4.8

Means within a row followed by the same letter do not differ significantly (P=0.05) as compared by Duncan's multiple range test.

In the nursery study, the Summit sower produced a higher percentage of plantable seedlings than both the Love-Oyjord and Whitfield sowers (table 2). This may have been due to a reduction in doubles by the Summit sower, although the Whitfield sower produced a higher density, which may have contributed to the higher cull percentage. Increasing "seed efficiency" by reducing culls 4 percentage points can be economically important when the present value of genetically improved seed is considered (3).

In addition to having the most precise seed placement, the Summit sower 1) provides excellent control of seed depth and cover, 2) does not waste seed at bed ends, 3) gives narrow drills, which allow lateral root pruning, and 4) is the simplest to calibrate. Calibration is accomplished by simply changing sprockets. The Summit sower can also prepare the bed and sow in one pass. Disadvantages of this sower include its slow speed, the necessity of having high-purity seed lots with high germination rates, and its higher purchase price than the other machines.

Some advantages of the Love-Oyjord sower include 1) its disk-type coulters, which give narrow drills to facilitate lateral root pruning, 2) easier calibration than the Whitfield, 3) its capability of sowing seed lots with low germination values and yet producing a good stand, and 4) a higher speed of operation than the New Zealand sower. Lott and Lowman (2) found the Love-Oyjord

sower to be easier to calibrate (especially for small seedlots) than several other sowers tested (not including the Summit and Whitfield sowers). Its main disadvantage is its lack of precision of seed placement.

The Whitfield sower cannot precisely space individual seeds and it is the most difficult to calibrate. However, it has a low initial cost, low maintenance, is light in weight, and can be run at a higher speed with a low-horsepower tractor. It can sow seeds in bands or narrow drills, and , like the Love-Oyjord, is capable of sowing seed lots with low germination values.

Table 2- Summary of nursery study

Sower	Density/m^2	Grade 1 (%)	Grade 2 (%)	Grade 3 (%)
Summit	285b	8a	84a	8b
Love-Oyjord	277b	8a	80ab	12a
Whitfield	315a	6a	79b	15a

Means within a row followed by the same letter do not differ significantly (P=0.05) as compared by Duncan's multiple range test.

Conclusions

Precision sowing of seed increases seedling uniformity. Most sowers currently used in forest nurseries are actually drills that often distribute seed in clumps. Cull seedlings can often arise from seeds sown too close together. Precision sowers have been developed that will sow one seed at a time, reducing seed clumping and the production of culls.

With the increasing use of genetically improved orchard seed in forest nurseries, wasting seed is becoming more and more expensive. By improving the seed efficiency or reducing cull percent, increased economic gains easily justify investment in precision sowers. Saving genetically improved seed not only avoids wasting expensive seed, but also increases income from the production of genetically improved seedlings and increases timber volume at harvest.

Literature Cited

1. Boyer, J.M.; South, D.B. Forest nursery practices in the South. Southern Journal of Applied forestry 8:67-75; 1984.
2. Lott, J.R.; Lowman, B.J. Evaluating precision seeders for tree seedling nurseries. Missoula, MT: U.S. Department of Agriculture, Forest Service, Equipment Development Center; 1976. 49 p.
3. South, D.B. Some economic aspects of forest seed efficiency. Southern Forest Nursery Management Cooperative Note 10. Auburn University, AL: Alabama Agricultural Experiment Station; 1984. 11 p.