DUSTING SEEDS WITH ALUMINUM POWDER

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Seeder performance was not improved and germination was reduced when seeds of Douglas-fir, Sitka and white spruces, and lodgepole pine were dusted with aluminum powder.

Uneven distribution of drill-sown seeds is one of the most important contributors to the overall seedling cull factor in British Columbia (B.C.) bareroot nurseries. Seed distribution is affected by several seeder-related factors, sowing conditions, or both. It has been suggested that treating seeds with some type of lubricant might improve seeder performance and seed distribution. Since aluminum powder has been used as a seed lubricant and an animal repellant in several direct seeding trials 1), we decided, early in 1977, to determine the effects of dusting seeds with aluminum powder on seed distribution, germination, and subsequent seedling growth, under local condition.

Materials and Methods

The experiment was conducted at the British Columbia Forest Service Koksilah Nursery near Duncan. The silt loam soil had been bare fallowed for a year prior to preparing the experimental seedbeds. Stratified (*3*) seeds of Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco), coastal and interior forms; Sitka spruce (Picea *sitchensis (Bong*.) Carr.), white spruce (*P. glauca* (Moench) Voss), and lodgepole pine (*Pinus contorta* Dougl.) were dusted before sowing with aluminum powder (Canbro Division of International Bronze Powders Ltd., 29 East Park, Valleyfield, Quebec, powder number 913, leafing grade) at a rate of 1 percent by storage weight (the stored seeds contained 7 to 8 percent moisture) of seeds and drill sown on June 20, 1977. The drill, constructed in part from Planet Junior components, is the type that has been used for several years in B.C. forest nurseries. It was calibrated to sow 155, 190, and 125 viable seeds per linear 0.3 m (1 ft) of seedbed (seven drill rows wide) for Douglas-fir, the two spruce species, and lodgepole pine, respectively.

The experimental design was completely random, with seeds of each tree species sown in two 18-m-long (60 ft) seedbeds. Treated and untreated seeds were each sown in two adjacent drill rows separated by two unsown rows. To determine seeder effects within species, drill rows two and three were sown with treated seeds in the first replicate and with untreated seeds in the second replicate. The same procedure was used in drill rows five and six.

Counts were made at the time of sowing, before covering the seeds, to determine seed distribution and again on July 15 and September 29 for germination and end-of-season survival. They were made at 10 randomly selected, 0.3-m-long (1 ft) sections of two adjacent treated and untreated drill rows of each seedling species. Seedling shoot length (soil line to terminal bud) was measured on September 29 on the same sites as was used for survival tallies. A maximum of 10 randomly selected seedlings per each 0.3 m of drill were measured. Count and shoot length data were subjected to analysis of variance and mean differences were compared, using the Student-Newman'Keuls' (*2*) multiple range test.

Results and Discussion

Table 1 gives the seed treatment (aluminum powder dusted vs. undusted seeds) effect, the seeder (machine) effect, and the interaction of these two factors on numbers of seeds sown in the experimental seedbeds. Dusting (treatment effect) with aluminum powder did not affect the numbers of interior Douglas-fir, Sitka spruce, or lodgepole pine seeds sown. Significantly fewer coastal Douglas-fir and significantly more white spruce seeds were sown when they were treated with aluminum powder. Numbers of seeds sown by the seeder (seeder effect) varied significantly among drills of coastal Douglas-fir, Sitka spruce, and lodgepole pine. The treatment-seeder interaction was not significant for interior Douglas-fir (a sowing error prevented determination of the interaction effect for coastal

Table 1. – *Effects of aluminum powder dusting, the seeder, and the interaction of both on numbers of seeds sown in drill rows*

	Seed species and number of seeds sown[1]				
	Douglas-fir		Sitka	White	Lodgepole
Variable	coastal	interior	spruce	spruce	pine
Treatment					
Treated	22a[2]	23a	27a	32a	14a
Untreated	31b	27a	26a	23b	15a
Seeder					
Drill 2	25ab	25a	25a	24a	12a
Drill 3	18b	25a	24a	27a	14ab
Drill 5	31a	24a	30b	31a	17b
Drill 6	31a	26a	27ab	28a	16b
Treatment X Seeder					
Treated					
Drill 2	—	21a	24a	32bc	9b
Drill 3	—	25a	25a	38c	12ab
Drill 5	—	23a	31a	32bc	19a
Drill 6	—	25a	28a	26b	17a
Untreated					
Drill 2	—	29a	25a	16a	15a
Drill 3	—	27a	24a	17a	16a
Drill 5	—	25a	30a	30bc	16a
Drill 6	—	27a	26a	29bc	14a

[1] Reading down, valid comparisons can only be made between means within each variable, i.e. treatment (two means), seeder (four means) and treatment X seeder (eight means) within each species. Means followed by the same letter do not differ significantly (5 percent level). Values are mean number of seeds 0.3 m (1 ft) of drill row. The dash indicates that no mean could be calculated because treated and untreated seeds were sown in the wrong drills.

[2] Means followed by the same letter are not significantly different.

Douglas-fir) or Sitka spruce. However, drill rows two and three of untreated white spruce and treated lodgepole pine received significantly fewer seeds than other drill rows.

Treating seeds with aluminum powder adversely affected germination of all species except interior Douglas-fir (table 2). In general, the powder did not affect seeding survival. Seedling shoot growth was less in drill rows sown with aluminum powder-treated Douglas-fir (both forms) and white spruce, while shoot heights of Sitka spruce and lodgepole pine were unaffected by the powder.

The results of this experiment show that much of the variation in numbers of seeds sown in our nurseries is attributable to the seeder and that treating seeds with aluminum powder does not improve seeder performance. Also, since the powder frequently harmed germination and seedling growth, we cannot recommend its use on locally-sown conifer seeds.

Table 2. – *Germination, seedling survival, and seedling shoot heights in seedbed drill rows sown with aluminum powder treated and untreated seeds'*

	Germination		Survival		Shoot heights	
	Treated (percent)	Un-treated (percent)	Treated (percent)	Un-treated (percent)	Treated (cm)	Un-treated (cm)
Douglas-fir, coastal form	50a[2]	60b	73a	77a	3.2a	4.2a
Douglas-fir interior form	50a	53a	90a	89a	2.4a	2.7b
Sitka spruce	71a	80b	48a	50a	0.8a	0.8a
White spruce	67a	84b	70a	81b	1.8a	2.0b
Lodgepole pine	74a	84b	93a	89a	3.1a	3.2a

[1] Values are based on counts made at 10 locations, each within treated and untreated drill rows; germination counts made July 15. End of season survival (based on number of germinants) and height data collected September 29. Laboratory germination of stratified, aluminum powder-treated seeds was 79, 74, 78, 63 and 79 percent for coastal Douglas-fir, interior Douglas-fir, Sitka spruce, white spruce, and lodgepole pine, respectively.

[2] Means followed by the same letter are not significantly different.

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