

ALASKAN WILLOW AND BALSAM POPLAR SEED VIABILITY AFTER 3 YEARS' STORAGE

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Viability of the North American willow (*Salix* spp.), in particular, and balsam poplar (*Populus balsamifera*) seeds is reported to be short even under optimum storage conditions (1, 2). Longevity of willow seed from Asia and Europe, however, has been maintained for up to 18 months by proper storage (3, 4). In an earlier study, we reported storage of seeds of Alaskan *S. alaxensis*, *S. glauca*, and *P. balsamifera* for up to 18 months with little loss in viability (5). Using the methods found to give the best results in our earlier work, we continued this research with additional seed lots of *S. alaxensis*, *S. glauca*, and *P. balsamifera* and two additional species, *S. bebbiana* and *S. novae-angliae*. The results of this study are presented here.

Methods

All seeds except for *S. glauca* were collected in June 1974 during natural dispersal near Fairbanks, Alaska (latitude 65°52' N., longitude 148°44' W.). *S. glauca*, collected in September 1974, is one of seven willows that disperse seed in the fall and early winter and exhibit nondeep seed dormancy.² A description of seed

collection and extraction methods is available (5).

Seeds of a species were stored in one 3-mil polyethylene bag placed inside another 3-mil bag. Both bags were sealed and stored at a temperature of -10° C. Germination tests were run at 25° C immediately after collection, and again after 2 years of storage. After 3 years, germination tests were conducted at 25°, 20°, 15°, 10°, and 5° C. *S. glauca* seeds were stratified at 2° to 5° C for 2 to 3 weeks. Four, 50-seed replications were used for each species-temperature combination. Tests were conducted 18 hours a day on cellulose pads for 2 weeks in petri dishes. Germination was considered normal if the seedling had chlorophyll, developed hypocotyl hairs and/or roots, and were erect; those seedlings not meeting these criteria were classified as abnormal. Differences reported are observed differences and not statistically derived.

Results and Discussion

For the summer-dispersing willows and poplar, reduction in total germination varied from 1.2 to 6.5 percent after 24 months of storage. After 36 months of storage, balsam poplar germination was reduced by 4.5 percent and the willows by 20 to 40 percent when germinated at 25° C. Germination for all species, however, was greater than 70 percent for at

least 1 temperature. There was only one consistent germination response among species; maximum 36-month germination occurred at temperatures of less than 25° C. The time needed to reach 50 percent germination was similar for fresh and stored seed, (i.e., 1 to 2 days at 25° and 20° C, 2 to 3 days at 15° C, and 5 to 10 days at 10° to 15° C).

S. glauca seed viability did not decline during storage. Dormancy, as measured by germination of stratified and unstratified seeds, was not broken after 36 months as it was in an earlier study with a different seed lot of this species (table 1) (5). Germination energy of stratified seed was similar to that of the summer-dispersing species.

P. balsamifera and *S. glauca* seeds retained higher viability over the 36-month period than did the three summer-dispersing willow species (table 1). These results are consistent with those of our earlier work, which suggested that fall-dispersed *S. glauca* seeds were more similar to *Populus* seeds than summer-dispersed *S. alaxensis* because they had higher viability and retained viability longer under the storage conditions tested.

This study substantiates the findings of our earlier study, which showed that seeds of Alaskan *Salix* and *Populus* species could be stored for at least 18 months without substantial loss in

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²Densmore, R., J. C. Zasada, W. D. Billings. Seed Reproduction Modes in Alaska Salicaceae. Unpublished manuscript on file at the Institute of Northern Forestry, Fairbanks, Alaska.

Table 1.—Seed germination and standard deviation for selected willows and balsam poplar after 0, 24, and 36 months storage.

| Species | 0 months ¹ | 24 months ¹ | 36 months | | | | | | | | | |
|----------------------------|-----------------------|------------------------|-----------|----------|--------------------|----------|----------|----------|----------|----------|----------|----------|
| | | | 25° C | | 20° C | | 15° C | | 10° C | | 5° C | |
| | | | Normal | Abnormal | Normal | Abnormal | Normal | Abnormal | Normal | Abnormal | Normal | Abnormal |
| ----- Percent ----- | | | | | | | | | | | | |
| <i>Salix alaxensis</i> | 94.5±1.8 | 88.0±7.1 | 55.5±9.8 | 22.0±4.0 | 60.0±9.4 | 25.5±8.2 | 67.5±3.4 | 25.0±6.6 | 74.0±4.6 | 11.0±3.8 | 58.8±8.5 | 24.0±6.7 |
| <i>S. bebbiana</i> | 97.0±1.4 | 93.4±2.2 | 76.0±3.6 | 13.5±3.0 | 88.5±3.4 | 6.0±4.4 | 80.0±6.3 | 10.0±4.3 | 88.5±4.1 | 7.0±5.3 | 82.0 | 8.0±2.8 |
| <i>S. novae-angliae</i> | 97.0±2.1 | 92.5±3.1 | 75.5±8.5 | 12.5±7.2 | 77.5±6.8 | 11.0±7.4 | 84.5±6.2 | 8.5±5.3 | 72.0±3.6 | 9.0±4.8 | 47.5±2.5 | 34.5±8.2 |
| <i>Populus balsamifera</i> | 99.5±1 | 98.2±1.2 | 95.0±2.6 | 0.5 | 88.0±5.9 | 0.5 | 94.5±2.5 | 1.5±1.0 | 98.5±1.9 | 0 | 93.0±2.6 | 2.0±1.6 |
| <i>S. glauca</i> | | | | | | | | | | | | |
| stratified | 95.0±2.7 | 96.2±3.2 | 94.0 | 0 | ² 100.0 | 0 | 100.0 | 0 | 100.0 | 0 | 94.0 | 0 |
| unstratified | 51.2±7.5 | 48.4±8.0 | 45.0±8.2 | 0 | 13.0±2.6 | 0 | 3.5±3.4 | 0 | 1.3±1.2 | 0 | 0 | 0 |

¹Germination at 25° C.

²Placed at 5° C after 2-week test and stratified at 5° C for 2 months. Test run at 20° C after stratification.

viability. This study also expands the previous work to include two additional *Salix* species and shows that viability can be retained for at least 36 months in some seed lots.

Literature Cited

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