Silverberry Seed Pretreatment and Germination Techniques

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Two dormancy mechanisms were found in silverberry seeds- a germination inhibitor and the seed being negatively photoblastic. The inhibitor is leachable with warm water; and the negative photoblasticism can be overcome by covering the seeds with soil.

Lands disturbed by the mining and extraction of oil sands in northeastern Alberta are normally reclaimed with native woody species. However, several potentially useful species such as silverberry (*Elaeagnus commutata* Bernh.) are currently not used to their full potential because of problems associated with overcoming seed dormancy.

Silverberry is ideally suited for land reclamation purposes because it is a thicket-forming shrub useful for wind and water erosion control. It grows well on hillsides, erosion gullies, and roadcuts where the soil is dry and low in nutrients (2), a soil characteristic generally found on mined sites. As well, silverberry fixes nitrogen under most conditions (6), which makes it a desirable nurse crop for land restoration.

The nature of seed dormancy in silverberry has been studied, but the conclusions have varied from nondormant (4) to coat-imposed dormancy (3) to the possible presence of a chemical inhibitor in the seeds (1, 5). This study was initiated to further examine and overcome seed dormancy in silverberry.

Materials and Methods

Silverberry fruits were collected in October 1982 from Cline River, Alberta. The cleaned seeds were stored at 4° C until April 1983 when the test was conducted. Seed pretreatment consisted of soaking the seeds in warm water for 0, 2, 4, and 6 days. For each treatment, a 1-liter jar was filled with warm water at 50° C. Approximately 450 seeds were then submerged in the water. The jar was left undisturbed at room temperature for 24 hours. After 24 hours, the water (now cooled to approximately 24° C) was drained. The jar was then refilled with fresh, warm (50° C) water and the seeds vigorously agitated and rinsed. This process was repeated three times. The seeds were again resoaked in warm (50° C) water. The agitating and rinsing were repeated after every 24 hours until the specified pretreatment time period was completed.

Then, all the seeds, including the control, were surface-treated with 3-percent hydrogen peroxide just before sowing. The seeds were immersed in the hydrogen peroxide solution for 3 minutes and then rinsed several times with sterile water. This treatment ensured that the seeds were pathogen-free at the time of sowing.

Two methods of seed germination were tested: "No soil" and "soil." In the "no soil" method, the seeds were placed directly on top of moistened filter papers in petri dishes. The dishes were covered to retain moisture. Water was added as required to maintain a moist surface. In the "soil" method, aluminum foil plates were half filled with a moist, 2:1 soil mixture of peat moss and vermiculite. The seeds were placed on the surface and covered with 1 centimeter of soil. The plates were then covered with clear plastic lids to prevent seed desiccation.

The germination test was conducted at room temperature. It consisted of four replicates of each combination of pretreatment duration and germination method. Each replicate consisted of 50 seeds. During the test period, seeds that became moldy were washed in a 3-percent hydrogen peroxide solution, rinsed with sterile water, and placed into new germination containers. Seeds that failed to germinate after the 21-day test period were cut open and examined for seed viability.

Results

Germination began 5 days after sowing. The results are presented in figure 1. The germination capacity was calculated based on the actual number of viable seeds sown per treatment replication. The seedlot has a 95.8-percent viability as determined by the cutting test.

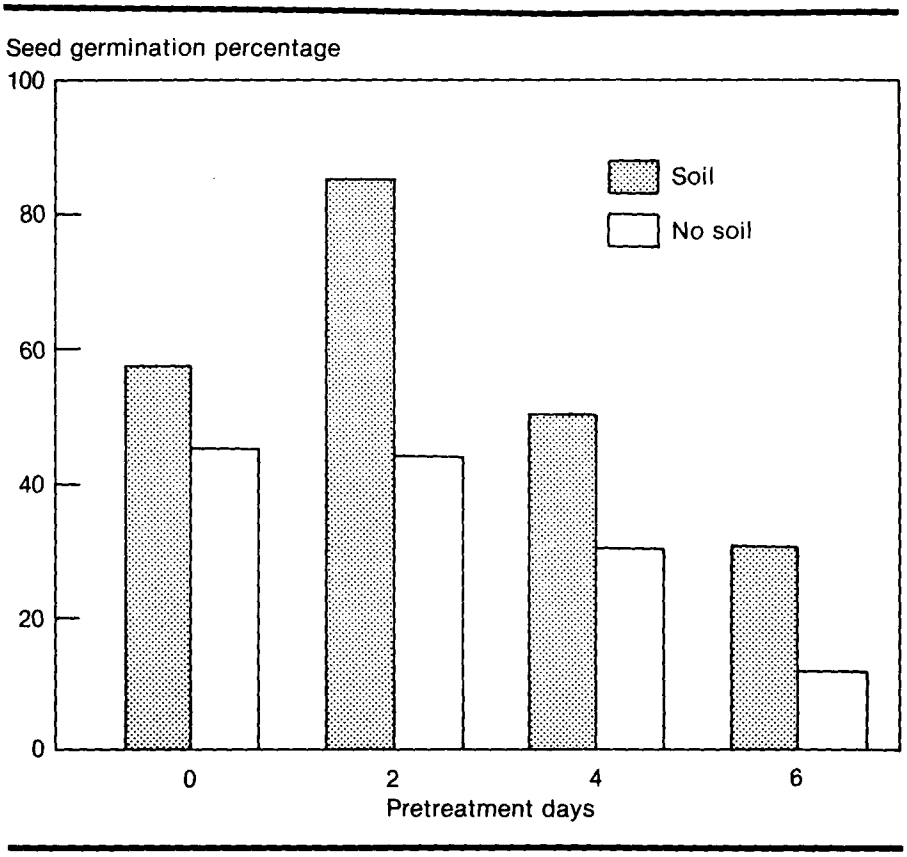

Figure 1—*Germination percentage of silverberry seeds as affected by pretreatment and germination techniques.*

Analysis of variance showed that the effects of soaking duration on seed germination were statistically significant. Significant differences were also found between the "soil" and "no soil" germination methods. The highest germination (85.3%) occurred on the seeds sown in soil after a 2-day warm-water soaking pretreatment. The germination capacity in both the sowing methods, however, decreased proportionately with prolonged soaking.

Discussion and Conclusions

Silverberry seeds have dual dormancy mechanisms: A germination inhibitor is present, possibly within the inner tissues and pericarp of the seeds and the seeds are negatively photoblastic (i.e., germination is inhibited by light and the seeds are thrown into a state of secondary dormancy).

The inhibiting substance is water soluble and it can be readily leached out, thus eliciting germination if the seeds are kept in the dark. Leaching can be accomplished by soaking the seeds in warm water, which is initially at 50° C, for 24 hours. They are then washed and rinsed thoroughly before resoaking in warm water for another 24 hours. Then the seeds are washed and surface-sterilized with a 3-percent hydrogen peroxide solution. For optimum germination, the seeds should be buried 1 centimeter deep.

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