# SEED TREATMENT FOR OPTIMUM PECAN GERMINATION

Wet sand stratification for 90 and 60 days and wet soak for 10 days were consistently higher in germinative value.

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A primary goal of hardwood nurserymen is to produce strong, healthy seedlings that emerge from the soil quickly and uniformly. Delayed or variable germination rates result in a shorter growing period and nonuniformity of the growing stock, an undesirable situation in conventional nursery practices.

Generally, large-seeded North American hardwood species exhibit some degree of embryo dormancy and many require cold, moist stratification for optimum germination. Southern sources of pecan (*Carya illinoensis*) will germinate without a period of stratification, but germination is poor and irregular.

Many seed pretreatment methods including ultrasonic waves (*4*) and cold, wet storage (*1, 2*) have been tried with varying degrees of success in pecan. The published results are rather inconclusive, and our experiment was initiated to evaluate a variety of treatments on a uniform sample of pecan seed.

**Methods and Procedures**

The germination study was conducted as two separate experiments, first in 1973 and again in 1974. Seeds for both studies were collected from the ground under trees in forest stands. Discolored or damaged seeds and seeds remaining in the husk were culled from the collections.

*1973 Study:* Seeds were collected in November 1973, from wild populations of pecan trees located in south-central Louisiana. Collection trees were selected randomly and 50 to 75 seeds were taken from each of 30 trees. These seeds were bulked and mixed to obtain one large, homogenous sample. The seeds were divided into lots of 100 for pretreatment.

Pretreatments used were:

- Wet cold sand (2° to 5° C) for 30, 60 and 90 days;
- Dry cold storage (2° to 5° C) for 30, 60 and 90 days;
- Cold water soak (2° to 5°C) for 5, 10 and 15 days;
- Room temperature (24° C) water soak for 5, 10 and 15 days;
- Acid ($H_2SO_4$) soak for 10, 20 and 30 minutes;
- Dry cold storage (2° to 5° C) for 60 days water soak for 10 days;
- Control (untreated room temperature).

The target date for planting was 1 April 1974, and at appropriate intervals (i.e., beginning 90 days before 1 April), seeds were subjected to the various pre treatment conditions. Four mil polyethylene bags were used for the sand stratification and dry storage treatments. Sand was heat-sterilized at 83°C for 12 hours. Laboratory beakers were used for the soak treatments.

Seeds were planted in plastic germinating trays filled with vermiculite, and placed on a greenhouse bench (no artificial heat). The trays were watered periodically to keep the medium surrounding the seeds continually moist.

*1974 Study:* Seeds were collected in 1974 from a wild population about 60 miles north of the 1973 collection area. The same storage conditions and pre treatments were applied with the exception of the $H_2SO_4$ soak and 60-day cold dry storage—10-day water soak. All seeds were planted on 1 April 1975.

Trays were checked at 5-day intervals for germination, and once the seeds began to germinate, a count was made every 3 days. A seed was considered germinated when the plumule was first observed. This procedure was followed for 60 days, and the results of both experiments were evaluated using Czabator's (*3*) germinative energy formula.

**Results and Discussion**

Germination response varied between pretreatments and years (table 1). In both studies, three seed pretreatments were consistently higher in germinative value. These were, in order of best

**Table 1.—***Results of stratifications and seed pretreatments on pecan seed collected in the fall of 1973 and 1974*

| Pretreatments | Germinative Value | | Mean Daily Germination | | Peak Value | | Percent Germination | |
|---|---|---|---|---|---|---|---|---|
| | 1973 | 1974 | 1973 | 1974 | 1973 | 1974 | 1973 | 1974 |
| Wet sand (2° to 5°C)—90 days | 2.53 | 3.62 | 1.03 | 1.61 | 2.46 | 2.25 | 62 | 90 |
| Wet sand (2° to 5°C)—60 days | 1.87 | 1.11 | 1.10 | 0.88 | 1.70 | 1.27 | 71 | 49 |
| HQO soak (24°C)—10 days | 1.73 | 0.57 | 1.20 | 0.80 | 1.48 | 1.00 | 72 | 45 |
| Dry storage (2° to 5°C)—60 days with $H_2O$ soak (24°C)—10 days | 1.14 | — | 0.88 | — | 1.29 | — | 53 | — |
| Wet sand (2° to 5°C)—30 days | 1.07 | 0.33 | 1.25 | 0.57 | 0.86 | 0.57 | 48 | 32 |
| $H_2O$ soak (2° to 5° C)—15 days | 0.71 | 0.64 | 0.83 | 0.73 | 0.86 | 0.88 | 54 | 41 |
| Dry storage (2° to 5°C)—30 days | 0.64 | 0.55 | 0.77 | 0.71 | 0.83 | 0.77 | 55 | 40 |
| Dry storage (2° to 5°C)—60 days | 0.54 | 0.75 | 0.73 | 0.82 | 0.74 | 0.93 | 46 | 46 |
| $H_2O$ soak (24°C)—5 days | 0.35 | 0.44 | 0.63 | 0.64 | 0.55 | 0.68 | 49 | 36 |
| Dry storage (2° to 5°C)—90 days | 0.35 | 0.73 | 0.63 | 0.84 | 0.56 | 0.87 | 43 | 47 |
| $H_2O$ soak (2° to 5°C)—10 days | 0.34 | 1.00 | 0.65 | 0.98 | 0.53 | 1.02 | 48 | 55 |
| $H_2O$ soak (2° to 5 C)—5 days | 0.31 | 0.41 | 0.60 | 0.61 | 0.51 | 0.68 | 67 | 34 |
| Control (no treatment) | 0.28 | 0.76 | 0.62 | 0.82 | 0.45 | 0.93 | 47 | 46 |
| $H_2SO_4$ treatment (10 min.) | 0.05 | — | 0.23 | — | 0.05 | — | 13 | — |
| $H_2SO_4$ treatment (20 min.) | 0.05 | — | 1.13 | — | 0.38 | — | 8 | — |
| $H_2SO_4$ treatment (30 min.) | 0.01 | — | 0.08 | — | 0.14 | — | 5 | — |

performance: Wet sand stratification (2° to 5° C) for 90 days, wet sand stratification (2° to 5° C) for 60 days, and water soak (24°C) for 10 days.

The remaining pretreatments showed variable results. In the 1973 experiment, all pretreatments except the acid soak were superior to the control, with some having relatively high germinative values compared to the control. This was not true in the 1974 study, where the control performed as well as or better than some of the pretreatments. However, there was little difference in germinative value or percent germination between the control and the next three most effective pretreatments, indicating little effect of these pretreatments.

In nursery practice, the desired result is a uniform, vigorous crop of seedlings, and the germinative value is the key to determining the most effective method of pretreating pecan seed to achieve these results. In several cases table 1) pretreatments yielded a high percentage of germination but low germinative values. Rating of treatments by germination percentage alone would, therefore, have placed inferior treatments ahead of the ones that actually produced the best results from a practical nursery production standpont.

## Literature Cited

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