

Presowing Treatments and Storage for Green Ash Seeds

W. H. Cram

Tree Nursery PFRA, Indian Head, Saskatchewan

Stratification for 90 days at 41 ° F was superior to soaking and warm plus-cold stratification for greenhouse sowing to test the viability of green ash seeds. Germination after 8 years of storage at 0° F was 80 percent.

Several presowing treatments have been reported to overcome seed dormancy for germination tests of green ash (*Fraxinus pennsylvanica* Marsh.) by the U.S. Department of Agriculture, Forest Service (4, 5). However, Bonner and Gammage (2) discovered no reliable viability test. Barton (1) reported 63-percent germination for green ash after storage at 41 ° F. for 7 years. This article reports on the germination of fresh green ash seeds after 10 presowing treatments and after storage at three temperatures for 1 to 8 years.

Materials and Methods

Presowing treatments. Bulkseed samples were harvested on October 6 from three trees. These were air-dried for 24 hours to 7.3 percent moisture content and then divided into 10 lots. Seeds from each lot and tree were surface sterilized by dipping in a 0.5-percent mercuric chloride solution. The seeds were then subjected to 10 presowing treatments. All seeds were then sown in a greenhouse in a sterilized medium (two parts

sand to one part soil), and the observed germination was recorded each day for 30 days.

Seed storage. Seed samples were harvested from three trees in October 16, then bulked and air-dried for 72 hours in the greenhouse to 6.3 percent moisture content. Each bulked sample was divided into 12 lots, which were sealed in individual 2-mil polyethylene bags. Four of each of the bagged lots were sealed in large poly bags; and these were stored at 0°, 24°, and 35° F. Viability of these seedlots was evaluated by greenhouse sowings after 90 days of stratification at 41 ° F and after 0, 1, 6, and 8 years of cold storage.

Moisture content of all seedlots was determined at harvest (after

drying) and after 1 to 8 years of storage, by oven-drying five samples of 10 seeds at 212° F for 24 hours.

Results and Discussion

Presowing treatments. Germination of seeds from all three trees (table 1) was increased significantly by the soaking treatments, but to a greater and more uniform degree by the stratification treatments. Mean germination was highest (88 to 90 percent) after warm plus cold stratifications for up to 90 days, although not significantly more than after cold stratification for 30 to 90 days.

In addition, the germination rate was fastest after stratifications for 90 days. However, the germination

Table 1—Germination¹ of green ash seeds from three trees following 10 presowing treatments

Presowing treatments			Seed trees and germination of seeds			Treatment means
Type	Temp.	Time	#1	#2	#3	
	°F	Days	----- % -----			
Dry	70	Check	5e ²	12d	11d	9e
Soak	70	10	22d	38c	76c	45d
Soak	70	20	59c	47c	83bc	60cd
Soak	70	30	61c	81ab	83bc	75bc
Strat.	41	30	80b	69b	91ab	80ab
Strat.	41	60	84ab	82ab	89abc	84ab
Strat.	41	90	92a	85ab	90ab	89ab
Strat.	70 & 41	30+60 ³	89a	87ab	89ab	88ab
Strat.	70 & 41	20+70	85ab	93a	90ab	89ab
Strat.	70 & 41	10+80	91a	85ab	94a	90a

¹Germination as a percentage of the 25 seeds sown for six replications.

²Values within a column followed by a common letter are not significantly different at the 1-percent level.

³Stratified alternatively at the warm and cold temperatures for the days indicated.

rate after cold stratification was faster for seeds from two trees than after any warm plus cold stratification for 90 days.

These results demonstrated the superiority of stratification as a presowing treatment for green ash seeds. Stratification for 90 days at 41 ° F would provide the most practical nursery method for seed viability testing. However, somewhat different results may occur with other than freshly harvested seeds.

Seed storage. Germination capacity of the seeds remained high after 1 year of storage at 0° to 35° F, but only for the 0° F storage after 6 and 8 years (table 2). Viability of seeds stored at 24° and 35° F decreased to 15 percent after 6 years and to zero after 8 years.

Table 2—Germination¹ of green ash seeds following stratification for 90 days after 1 to 8 years of storage at three temperatures

Storage temperatures	Years of storage and germination			
	0	1	6	8
°F	----- % -----			
0	86	86a ²	71a	80
24	86	81a	15b	0
35	86	83a	15b	0

¹Germination capacity as a percentage of 25 seeds sown with six replications.

²Means within a column followed by a common letter are not significantly different at the 1-percent level.

These levels of seed viability after storage were inversely related to the seed moisture levels. Germination was 86 percent after harvest when the seed moisture was 6.3 percent and 86 percent after 1 year of storage at 0° F when the seed moisture was 6.4 percent. However, the germination decreased to 71 and 80 percent after 6 and 8 years of storage at 0° F when the seed moisture increased to 8.8 and 9.8 percent, respectively. Germination of seeds stored at 24° and 35° F for 1 year was 81 and 83 percent, respectively, when the corresponding moisture contents increased to 8.0 and 7.1 percent. Then, the germination after 6 years of storage at both 24° and 35° F decreased to 15 percent when seed moisture increased to 13.8 percent. Finally, the seed viability was zero for storage at both 24° and 35° F, when the seed moisture increased to 18.6 percent after 8 years of storage. Barton (1) reported 83 percent germination for ash seeds with 7.6 percent moisture after sealed storage for 1 year at 41 ° F, 51 percent after 5 years of storage, 63 percent after 7 years, and 39 percent after 8 years; but no seed moisture levels were reported after 5 to 8 years of storage.

In the present study, seed moisture increases during storage to the ambient moisture levels of the storage rooms were attributed to permeability of the 2-mil polyethylene bags. This was previously reported by Owen (3).

Thus, heavier poly bags or other nonpermeable containers are required to prevent absorption or loss of moisture for long-term storage of ash seeds.

Literature Cited

1. Barton, L. V. Viability of seeds of *Fraxinus* after storage. *Contrib. Boyce Thompson Inst.* (Yonkers, NY). 13: 427-432; 1945.
2. Bonner, F. T.; Gammage, J. L. Comparison of germination and viability tests for southern hardwood seeds. *Tree Plant. Notes.* 18(3): 21-23; 1967.
3. Owen, E. G. The storage of seeds for maintenance of viability. *Bull.* 43. Farnham, Beshire, England: Commonwealth Bureau of Pastures and Field Crops, Commonwealth Agricultural Bureau; 1956.
4. Schopmeyer, C. S., tech. coord. *Fraxinus*. In: *Seeds of woody plants in the United States.* Agric. Handb.450. Washington, DC: U.S. Department of Agriculture; 1974: 411-416.
5. U.S. Department of Agriculture. *Fraxinus*. In: *Woody plant seed manual.* Misc. Pub. 654. Washington, DC: U.S. Department of Agriculture; 1948: 178-183.