



Figure 1. One-y-old elderberry plant of accession 9084126 propagated from seed. Photo by Sergio A Perez

Comparison of seed germination techniques for common elderberry (*Sambucus nigra* L. ssp. *canadensis*)

John W Leif, John C Durling, and David W Burgdorf

ABSTRACT

Soaking common elderberry seeds (*Sambucus nigra* L. ssp. *canadensis* (L.) R. Bolli [Caprifoliaceae]) in sulfuric acid followed by a 60-d stratification, or subjecting common elderberry seeds to a 60-d warm, moist treatment followed by a 90-d stratification, significantly increased seed germination of accession 9084126 common elderberry seeds. Stratification alone was less effective in promoting germination than was acid scarification followed by stratification or warm, moist treatment followed by stratification. Germination of common elderberry seeds soaked in hot water was not significantly different from the control treatment.

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KEY WORDS

American black elderberry, stratification, scarification, sulfuric acid, Caprifoliaceae

NOMENCLATURE

USDA NRCS (2011)

Common elderberry, also known as American black elderberry (*Sambucus nigra* L. ssp. *canadensis* (L.) R. Bolli [Caprifoliaceae]), is a woody shrub that grows 2 to 5 m (80 to 200 in) tall (US Forest Service 1948). Common elderberry can grow in a variety of soil conditions. It can tolerate saturated soils but usually occupies well-drained, slightly acidic soil (pH 5.5 to 6.0) bordering streams and in adjacent bottomlands. It also grows on gray forest soils and muck (Laurie and Chadwick 1931). Common elderberry has an extensive root system that is useful for stabilizing streambanks, lakeshores, and other moist, erosion-prone sites.

Common elderberry reproduces from seeds, sprouts, layers, and root suckers. Fruit of common elderberry contains 3 to 5 single-seeded nutlets (Krefting and Roe 1949). Common elderberry usually bears seed on second-year and older canes (Ritter and McKee 1964). Vegetative propagation can be achieved through hardwood cuttings (Ritter and McKee 1964) and through softwood cuttings (Dirr and Heuser 1987).

Common elderberry seeds require scarification and (or) stratification for good germination during the first year after collection (Worley and Nixon 1974). Successful germination has been achieved by planting common elderberry seeds in the fall and allowing them to overwinter in cold conditions (Anonymous 2001). Complete germination often takes 2 y. Several scarification and (or) stratification treatments have been described in scientific literature. One treatment involves scarification with sulfuric acid for 10 to 20 min, rinsing, followed by a 60-d stratification at 2 to 4 °C (35 to 39 °F) (Heit 1967). A second scarification treatment involves soaking in hot water for 24 h, followed by a 60-d warm (24 °C [75 °F]), moist treatment and 60-d stratification (Schultz and others 2001). A treatment not requiring scarification included a 60-d warm, moist treatment followed by 90-d stratification (Krefting and Roe 1949).

The Rose Lake Plant Materials Center (PMC) conducted evaluations on 31 collections of common elderberry from 1998 through 2001. As the result of those evaluations, accession 9084126 was identified as having desirable characteristics of growth, branching, fruit production, and minimal incidence of insect damage and disease (Figure 1). The Rose Lake PMC released this accession as Vintage Germplasm common elderberry through the Natural Resources Conservation Service Plant Materials Program for use in conservation practices (Leif and others 2011). Our research objective was to identify seed treatments that will improve seed germination of common elderberry accession 9084126.

MATERIALS AND METHODS

Fruits from common elderberry accession 9084126 were harvested by hand in September 2007 (Figure 2). Berries were depulped using a food blender (blades covered) partially filled with water. The mixture was then hand screened, and empty seeds and debris were separated from viable seeds by floating the materials in water (Anonymous 2001). Seeds were allowed to dry for 72 h after depulping (Figure 3). Seeds were then subjected to pre-planting treatments or were planted directly into containers. A tetrazolium test indicated the seedlot had 26% viable seeds.

We evaluated 5 treatments for their effects on germination: 1) no treatment (control); 2) 90-d stratification (4 °C [39 °F]); 3) 60-d warm, moist treatment (24 °C [75 °F]) followed by 90-d stratification; 4) scarification in hot water followed by 60-d



Figure 2. Mature elderberry plant of accession 9084126 with fruit production. Photo by Sergio A Perez



Figure 3. Common elderberry seed of accession 9084126. Photo by John W Leif

warm, moist treatment followed by 60-d stratification; and 5) scarification in 90% sulfuric acid followed by 60-d cold stratification.

Seeds were wrapped in muslin cloth and placed in damp sphagnum peat moss for stratification or warm moist treatment.

Sulfuric acid scarification was achieved by soaking seeds in 90% sulfuric acid for 10 min, then rinsing thoroughly before stratification. Hot water scarification was done by placing seeds into hot (80 °C [176 °F]) water. The water was removed from heat and allowed to cool to room temperature (24 °C [75 °F]) for 24 h.

Seeds were treated on 14 September 2007. Control seeds were planted into containers inside a greenhouse on 14 September 2007, whereas scarified and stratified seeds were planted when their stratification period was complete. Containers were filled with Suremix Coir Mix® (pH 5.2 to 5.4) (Sure Michigan Grower Products, Galesburg, Michigan, 800.354.2713). Three

replicates of 100 seeds for each treatment were planted at a depth of 0.6 cm (0.25 in), and germination was evaluated 48 d after planting. A seed was considered germinated if the cotyledons were visible above the soil surface. Germination, expressed as the percentage of total viability of the seedlot, was subjected to analysis of variance procedures in Statistix® 8 (Analytical Software 2003). When significant differences were detected, means were separated using a least significant difference test at ≤ 0.05 .

RESULTS AND DISCUSSION

Control seeds had very low germination, as did seeds scarified in hot water (Table 1). Treating seeds with 90-d stratification improved germination 7X compared with the control and hot water scarification treatments. The best germination, however, was achieved with either a 60-d warm, moist treatment followed by 90-d stratification, or scarification with sulfuric acid followed by 90-d stratification (Table 1). Our best treatments corroborate results of other studies on common elderberry germination (Krefting and Roe 1949; Heit 1967; Worley and Nixon 1974). Based on our results and on the literature, prudent nursery managers should treat common elderberry (accession 9084126) seeds with a 60-d warm, moist treatment followed by 90-d stratification, or, scarify seeds with sulfuric acid before employing 90-d stratification.

TABLE 1

Germination of accession 9084126 common elderberry seeds 48 d after planting.

Scarification	60-d warm, moist treatment	90-d stratification	Germination (%) ^{z,y}	Standard deviation around treatment mean
No	No	No	5.0 bc	1.8
No	No	Yes	35.7 b	10.1
No	Yes	Yes	69.2 a	19.1
Hot water	Yes	Yes	0.0 c	0
Sulfuric acid	No	Yes	73.0 a	22.6

^z Germination expressed as a percentage of the viability of the seedlot (26%) as determined by tetrazolium test.

^y Means followed by the same letter are not statistically different using least significant difference test ($P \leq 0.05$).

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REFERENCES

- Analytical Software. 2003. Statistix® 8 User's Manual. Tallahassee (FL): Analytical Software. 395 p.
- Anonymous. 2001. Propagation protocol for production of *Sambucus canadensis* seeds; USDA NRCS—Quicksand Plant Materials Center, Quicksand, KY. In: Native Plant Network. URL: <http://www.nativeplantnetwork.org> (accessed 29 Nov 2010). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery.
- Dirr MA, Heuser CW Jr. 1987. The reference manual of woody plant propagation from seed to tissue culture. Athens (GA): Varsity Press. 239 p.
- Heit CE. 1967. Propagation from seed. Part 6. Hardseededness—a critical factor. *American Nurseryman* 125:10–12.
- Krefting LW, Roe EI. 1949. Role of some birds and mammals in seed germination. *Ecological Monographs* 19:269–286.
- Laurie A, Chadwick LC. 1931. The modern nursery—a guide to plant propagation, culture, and handling. New York (NY): Macmillan. 494 p.
- Leif JW, Durling JC, Burgdorf DW. 2011. Notice of release of Vintage Germplasm common elderberry: a selected class of natural germplasm. *Native Plants Journal* 12(20):pages in this issue.
- Ritter CM, McKee GW. 1964. The elderberry: history, classification, and culture. *College Station (PA): Pennsylvania Agricultural Experiment Station Bulletin* 709:21.
- Schultz J, Beyer P, Williams J. 2001. Propagation protocol for production of container *Sambucus canadensis* L. plants; USDA Forest Service—Hiawatha National Forest, Marquette, Michigan. In: Native Plant Network. URL: <http://www.nativeplantnetwork.org> (accessed 29 Nov 2010). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery.
- US Forest Service. 1948. Woody-plant seed manual. Washington (DC): USDA Miscellaneous Publication 654. 416 p.
- [USDA NRCS] USDA Natural Resources Conservation Service. 2011. The PLANTS database. URL: <http://plants.usda.gov> (accessed 9 Mar 2011). Baton Rouge (LA): National Plant Data Center.
- Worley DM, Nixon CM. 1974. Shrubs and vines for northeastern wildlife. Upper Darby (PA): USDA Forest Service General Technical Report NE-9. 180 p.