Germinating Common and Cat Greenbrier

Franz L. Pogge and Bradford C. Bearce

Forestry technician, USDA Forest Service, Northeastern Forest Experiment Station, and professor, Division of Plant Science, West Virginia University, Morgantown, WV

Seeds of common (Smilax rotundifolia *L.) and cat greenbrier (*S. glauca *Walt) were tested for germinative energy, total germination, and germinative potential. Light appears to be a requirement for common greenbrier.* Tree Planters' Notes 40(1) :34-37; 1989.

Greenbriers are tremendously important for wildlife. They produce fruits nearly every fall, and the fruits hang on the vine until the next spring or summer if they are not consumed before then. In many places, they are the preferred food of ruffed grouse, white-tailed deer, black bear, cottontail rabbits, golden mice, and fish crows. They are also eaten by other species when their preferred food items are scarce (2).

Germination requirements for seed of the many greenbrier species found throughout the United States have not been reported, although common and cat greenbrier stem and rhizome cuttings have been propagated (3). Seed germination research is needed to develop an additional method of establishing greenbrier as a source of food for wildlife. In this study, we report on conditions for germination of seeds of common greenbrier (*Smilax rotundifolia* L.) and cat greenbrier (*S. glauca* Walt).

Materials and Methods

Fruits of common and cat greenbrier were collected from 175 tangles at 34 locations in northern West Virginia and in southwestern Pennsylvania. They were cleaned with a depulping machine designed for cleaning black cherry (1). Seeds used in the study were either freshly depulped or depulped, air dried, and stored at 2 to 5 °C until treated.

A complete random design was used for the study. Two hundred seeds of each species, divided into four replicates of 50 seeds each, were used for each treatment.

Treatments were designed to test the effects of cold stratification, germination promoters, light, and seed longevity on greenbrier seed germination.

Seed stratification. Stored seeds were planted 12 to 15 mm deep in a soilless mixture in 50-seed flats and kept at 4 °C for 0, 90, 150, 180, or 210 days. The soilless mixture comprised equal parts (v:v) sphagnum peat and vermiculite, with 1 pound dolomitic limestone, 3 ounces 20% superphosphate, 2.5 ounces $Ca(N0^3)^2$, 1.5 ounces $MgS0^4$, 1 tablespoon iron chelate, and 1 tablespoon fritted trace elements added per .1 cubic yard of peat-vermiculite mix.

Germination promoters.

(a) Freshly depulped or stored seeds were soaked for 24 or 48 hours in a 1, 2, or 3% thiourea solution and sown 12 to 15 mm deep in the soilless mix in 50-seed flats.

(b) Stored seeds were placed between paper towels, which were then rolled in a thin sheet of plastic; the rolls were placed upright in beakers containing 0, 1, 50, or 100 ppm gibberellic acid.

(c) Seeds were sown 12 to 15 mm deep in the soilless mix in 50-seed flats and watered with a 200-ppm formic acid solution (first watering only).

Light requirements. Stored seeds were sown on the surface of the soilless mix and placed in dark (yellow) or clear plastic bags.

Seed longevity/light.

(a) Seeds stored for 16 months were either (1) sown on top of the soilless mix in 50-seed flats, (2) sown 12 to 15 mm deep in the soilless mix, or (3) given 5 days of light and then sown 12 to 15 mm deep in the soilless mix.

(b) Seeds stored for 5 years were placed between paper towels, which were then rolled in a thin sheet of plastic, and the rolls were placed upright into beakers of water. These seeds were also given continuous light.

For treatments using the soilless mix, the 50-seed flats were randomly assigned to trays. These trays were placed in clear plastic bags, except for one treatment group that was placed

in a dark (yellow) plastic bag. Bags were then sealed to retard moisture loss.

Germination test for each treatment was conducted by placing the plastic-covered trays about 0.5 m, and the beakers about 1.5 m, from 40-watt cool white fluorescent bulbs (lighted 10 hours per day) in a laboratory at about 22 °C. Germination was recorded at least once a month. The following germination parameters were calculated for each treatment:

Germinative energy, the percentage of seeds that germinate during the period of most rapid germination with respect to time.

Total germination, the percentage of seeds germinated by the end of the test period.

Potential germination, the percentage of seeds germinated in the study plus all ungerminated seeds that are capable of germinating (those that appear healthy and normal).

Light intensities were measured. Clear plastic bags allowed up to 160 foot-candles of light to reach the surface of the medium. Yellow plastic bags allowed up to 20 foot-candles of light to reach the surface. At a depth of 6.25 mm (¼inch), less, than 1 to 3 foot-candles of light filtered through the medium. At a depth of 12.5 mm (½ inch), less than 1 foot-candle filtered through the medium. Light under the paper towels was 6 foot-candles or more.

At the end of 2 years, healthy-looking ungerminated seeds in all treatments planted below the surface of the soilless mix were sifted out of the medium and seeds from all treatments were mixed together and planted on

Table 1—*Greenbrier seed germination after 2 years under various treatments (in percent); germinative energy was measured in common greenbrier from 2 to 4 months and in cat greenbrier from 10 to 14 months*

	Common greenbrier			Cat greenbrier		
Treatments	Germinative energy	Total germination	Germinative potential	Germinative energy	Total germination	Germinative potential
Paper towel						
Distilled water	91.0	95.5	95.5	75.5	82.0	86.5
1 ppm Gibberellic acid	63.5	74.5	74.5	62.0	69.0	74.5
50 ppm Gibberellic acid	43.5	45.0	45.0	39.0	43.0	44.0
100 ppm Gibberellic acid	33.5	39.5	39.5	25.0	25.0	25.0
Seeds on top of medium						
Clear plastic bag	62.0	97.0	97.0	31.0	40.5	73.0
Dark plastic bag	59.5	71.0	74.5	34.5	40.5	60.5
Seeds inside medium						
Control	4.5	9.0	74.0	1.0*	1.5	39.5
90 Days at 4 °C	12.0	17.5	66.5	1.0*	3.0	44.0
150 Days at 4 °C	0.5	37.5	80.5	9.5	12.5	51.0
180 Days at 4 °C	—	—	—	0.0	3.5	46.0
210 Days at 4 °C	—	—	—	1.0*	3.0	44.0
Formic acid (200 ppm) soaked medium at start	1.0*	8.0	87.5	8.5	12.5	63.0
Thiourea soaked 24 hr†	4.0	12.5	84.0	8.5	10.0	46.0
Thiourea soaked 48 hr†	10.0	19.0	87.0	11.0	15.0	61.0
Thiourea air-dried†	6.0	16.5	89.0	11.5	15.0	63.0
Thiourea freshly depulped†	8.0	14.5	82.0	8.0	10.0	44.5

*Germination after 3 months for common greenbrier, 12 months for cat greenbrier. Germinative energy could not be established in these.
†For thiourea the average percent germination is shown; there was no discernible difference between 1, 2, and 3% solutions.

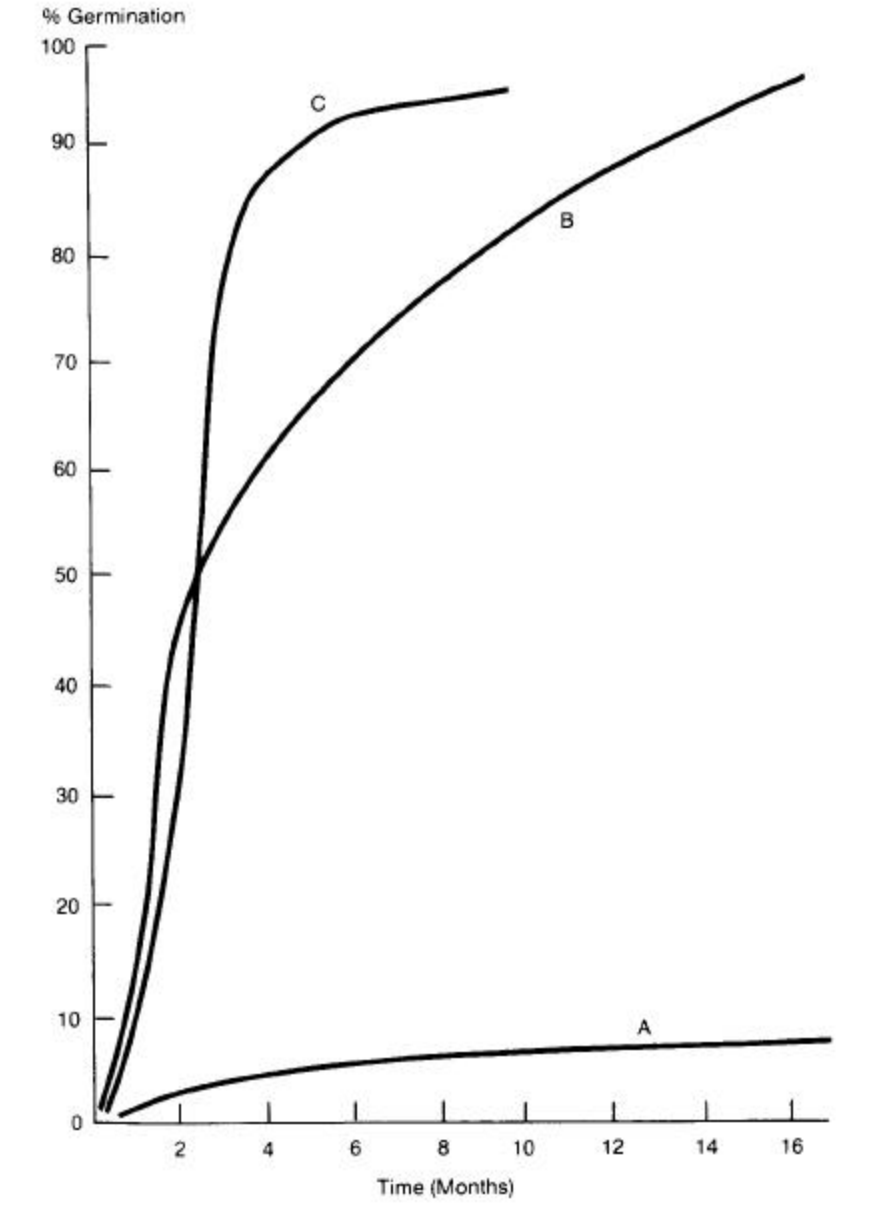

Figure 1—*Effect of light on common greenbrier seed germination.* **A** = *seeds inside medium,* **B** = *seeds on top of medium, clear plastic bag,* **C** = *seeds between paper towels.*

the surface of a new soilless mixture. They were placed under fluorescent lights as before and observed for 10 months.

Results

Exposure to light increased germination significantly in both species of greenbrier (table 1, fig. 1). Common greenbrier seeds germinated in 2 to 4 months under light (table 1). Germinative energy under paper towels with distilled water was 91% after 4 months. Total germination for seeds receiving light averaged from 95 to 97%, and in some replications it was 100%. Response of cat greenbrier seeds was slower; germinative energy in seeds placed between paper towels in distilled water was only 75.5% after 15 months. Total germination after 2 years was 82% and germinative potential was 86.5%.

Giving common greenbrier seeds 5 days of light was not enough. Of common greenbrier seeds stored for 16 months, then given 5 days of light and planted 12 to 15 mm deep; only 4% germinated (table 2).

No treatment carried out—formic acid, thiourea, gibberellic acid, and stratification at low temperature—significantly increased seed germination (table 1).

Seeds sifted out of the soilless mix at the end of the 2-year study and placed on top of a

Table 2—*Storage and light treatments on the germination of common greenbrier seeds*

Treatment	Length of tests (months)	% germination	% potential germination
Stored 16 months—light	7	43.0	—
Stored 16 months—5 days of light, then no light	7	4.0	—
Stored 16 months—no light	7	0.0	—
Stored 61 months—continuous light	9	83.5	97.0

new soilless mix (all treatments mixed together) yielded results similar to those from seeds in the study receiving light.

Viability remained high in seeds stored for 5 years at 2 to 7 °C at about 2% moisture content. After 9 months, 83.5% of the common greenbrier seeds placed under continuous light had germinated (table 2). Germinative potential was 97%. In cat greenbrier seeds, germination was only 19.8%, after 9 months, but germinative potential was still 92.8%.

Discussion

The intensity of light in our studies was not very high, but it produced excellent germination in common greenbrier seeds. Cat greenbrier may require higher light intensities. Common greenbriers usually grow in or along edges of deep woods and fencerows where light intensities are low. Cat greenbriers are usually found in the open where light intensities are quite high.

Constant light at room temperature did not increase germination of cat greenbrier seeds in our studies, but the same flats later placed under mist in a greenhouse produced a nice uniform stand of seedlings. In the greenhouse, the seeds received much more light, and this may be the reason they germinated well there. Duration of light may also be important, because 5 days of light did not result in good germination in common greenbrier.

In our studies, light appears to be a requirement for germination of at least the common greenbrier. This may explain why a great many more common greenbriers are found in recently logged (and other) areas where soil has been disturbed, even lightly, than in undisturbed areas. In these areas, both the buried seeds brought to the surface and freshly distributed seeds will obtain light yet are firmly in contact with the soil.

Literature Cited

1. Dorn, D.; Flick, V. 1969. Seed cleaning equipment for removing pulp from black cherry. Tree Planters' Notes 20(3):11-12.
2. Pogge, F.L. 1973. Greenbriers great for wildlife. Pennsylvania Game News 44(7):29-31.
3. Pogge, F.L.; Gill, J.D.; Bearce, B.C. 1974. Rooting common and cat greenbrier. Res. Note NE-189. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 6 p.