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GERMINATION CONDITIONS FOR POISON IVY

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Abstract—Several scarification and stratification treatments were tested to optimize germination conditions for poison ivy [*Toxicodendron radicans* (L.) Kunst]. Fall-collected seeds soaked for 1 hour in water showed increasing germination with increasing stratification. Scarification with concentrated sulphuric acid for 30 minutes resulted in approximately 65 percent germination, independent of stratification. Increasing the duration of the acid treatment resulted in diminished germination. The seeds with the most natural treatments, those soaked in water for 1 hour, and those collected in February, continued to germinate beyond the standard 4-week observation period for these studies. The prolonged germination resulted in high overall germination rates, especially with longer stratification.

INTRODUCTION

Poison ivy [*Toxicodendron radicans* (L.) Kunst] is a widespread, native North American dioecious plant in the family Anacardiaceae (Gillis 1971). The plant has numerous growth forms including shrub, subshrub, or climbing vine, and can be so abundant that it is the dominant understory plant in some habitats. Poison ivy reproduces both sexually from seeds dispersed by birds or animals and vegetatively from aboveground vines, rhizomes, or root crowns. The plant is well known because the leaves and stems exude an oil, urushiol, that causes a contact dermatitis in humans.

Despite, or perhaps because of its obvious competitive nature and abundance, there is very little information about poison ivy seed germination requirements. Talley and others (1996) tested the effects of various tree extracts on poison ivy germination, but their controls only germinated successfully 24 percent of the time. Brinkman (1974) reported germination conditions for eight species of ornamental *Rhus* but not for poison ivy.

We require specific germination conditions to produce even-aged competitor plants such as poison ivy for our ecological studies of pondberry [*Lindera melissifolia* (Walt.) Blume], an endangered species in the family Lauraceae that grows in seasonally flooded bottomland hardwood habitats. In this study, we assessed the effects of several pregermination treatments reported by Brinkman (1974) to aid germination in other species of *Rhus*.

MATERIALS AND METHODS

We collected poison ivy drupes on December 19, 2001, from Leroy Percy State Park, located 5 miles west of Hollandale, Washington County, MS, and from a site on Deer Creek on the Stoneville Agricultural Research Station near Leland, Washington County, MS. Drupes were left to dry and stored in Stoneville at 68 °F until January 30, 2002, when 25 seeds from each site were planted in fresh potting soil and watered until February 22, 2002. When it became apparent that these seeds were not going to germinate, we started over with batches of 200 seeds from the original Stoneville collection and a new (late-picked seeds) collection made on February 23, 2002, from the Stoneville site. The seeds were either soaked in water for 1 hour or scarified by soaking them in concentrated sulphuric acid for 30 minutes, 1 hour, 3 hours, or 6 hours. Two groups of 50 seeds from each treatment were then germinated immediately, and 2 groups of 25 seeds from each treatment were cold stratified in wet sand at 4 °C for 30, 60, or 90 days. Seeds were germinated on Kimpak® in a Stults germination cabinet set for an 8-hour photophase, 16-hour scotophase, and a fluctuating 30 °C-daytime 25 °C-nighttime temperature regime. Seeds were allowed to germinate for 4 weeks; however, seeds in two treatments, the 1-hour soak in water and the late-picked seeds, were slow to germinate and therefore were observed for 12 weeks until there were no more visibly viable seeds.

RESULTS

We averaged the percentages of seeds that germinated for the two replicates for each trial (table 1). The paired replicates were quite consistent, with only one difference as great as 20 percent (five seeds) of a treatment. Scarification with concentrated sulphuric acid and cold stratification improved germination. Soaking seeds in sulphuric acid for 30 minutes resulted in 63- to 72-percent germination independent of stratification, but increasing exposure to acid reduced germination. Soaking seeds in acid for 3 or more hours reduced germination to negligible levels (table 1). Seeds from the original collection on December 19, 2001, soaked in water for 1 hour, and seeds collected on February 23, 2002, also soaked in water, were much more dependent on stratification for germination. Without stratification, germination was negligible, and after 4 weeks there was a general trend of increasing germination with increased stratification time. Unlike the acid-treated seeds, which completed germination or died within the standard 4-week germination period, the water-soaked seeds continued to germinate for 12 weeks, with 60- to 96-percent final germination rates. We found no apparent relationship between

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Table 1—Mean percent germination of poison Ivy seeds after 4 weeks and 12 weeks for 0, 30, 60, and 90 days of stratification

	Days stratified			
Treatment[a]	0	30	60	90
After 4 weeks				
1 hour soak in water	0	32*	22*	40*
Picked in February	1	40*	42*	72*
H_2SO_4 30 minutes	63	72	66	70
H_2SO_4 1 hour	34	62	50	52
H_2SO_4 3 hours	16	2	0	0
H_2SO_4 6 hours	3	0	0	0
After 12 weeks				
1 hour soak in water	0	82	60	70
Picked in February	1	92	96	90

[a] Treatments marked with an asterix are those that had viable seeds left after the 4-week test period and were tested for an additional 8 (12 total) weeks.

length of stratification and germination success after all the seeds had germinated (table 1).

DISCUSSION

Germination of poison ivy was clearly ameliorated by applying at least some of the pregermination treatments. Soaking seeds in sulphuric acid for 30 minutes or even 1 hour resulted in > 50 percent germination. Since germination decreased with increasing time in acid, it might be possible to get higher germination rates with shorter soak times, such as 15 minutes. Sulphuric acid presumably breaks dormancy in poison ivy seeds by eroding the brachysclerids and osteosclerids in the carpellary micropyle region as it does in *R. aromatica* (Li and others 1999). Lengthy soaking in acid (3 to 6 hours) is obviously deleterious. Perhaps most interesting is the uncoupling of scarification and stratification we observed with the acid treatment. Seeds soaked for 30 minutes in acid germinated with no cold stratification, almost as well as those with up to 90 days of cold treatment.

Talley and others (1996) soaked poison ivy seeds in acid for 1 hour and then cold stratified them in wet paper towels at 5 °C for 7 days, -5 °C for 14 days, and then another 7 days at 5 °C. Their maximum germination rate was 24.3 percent, less than half the germination rates for our 30-minute acid treatment with or without stratification. Results from the experiment by Talley and others (1996) did approximate our 1-hour acid treatment without stratification (34 percent), but germination was < 50 percent of our acid plus stratification treatments.

In our own experiment, seeds soaked in water did not germinate without cold stratification, and those picked late in February, presumably with longer cold treatment from the environment prior to collection, had higher germination rates than those stored indoors. At 4 weeks, the typical duration of a germination test, we observed that increasing cold stratification improved germination, but that many ungerminated seeds were still viable. When we extended the germination period for 8 more weeks, the percent germination exceeded that of the stratification treatment seeds. Adaptively, prolonged germination time could help poison ivy avoid unfavorable environmental perturbations. Seeds soaked in acid did not quite achieve the germination rates of water-treated seeds, but eliminating the need for stratification and synchronization of germination could be useful for mass propagation.

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Description: Ninety-two papers and thirty-six poster summaries address a range of issues affecting southern forests. Papers are grouped in 15 sessions that include wildlife ecology; fire ecology; natural pine management; forest health; growth and yield; upland hardwoods - natural regeneration; hardwood intermediate treatments; longleaf pine; pine plantation silviculture; site amelioration and productivity; pine nutrition; pine planting, stocking, spacing; ecophysiology; bottomland hardwoods - natural regeneration; and bottomland hardwoods—artificial regeneration.