

# Comparison of Physical, Acid, and Hot Water Scarification on Seed Germination in Eastern Redbud<sup>©</sup>

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## INTRODUCTION

Eastern redbud (*Cercis canadensis* L.) is a common woody legume landscape tree with a hard seed coat that is impermeable to water (Geneve, 1991). Legume seeds are classified as being physically dormant (Baskin and Baskin, 1998). Most temperate woody legumes display only physical dormancy, but eastern redbud also has a physiological dormancy that requires chilling stratification for germination (Geneve, 1991).

Alleviation of physical dormancy in tree seeds usually involves scarification to mechanically abrade the seed coverings or more commonly seeds are treated with concentrated sulfuric acid to scarify the seed surface (Hartmann et al., 2011). Alternatively, redbud seeds respond to hot water treatments to relieve physical dormancy (Geneve, 2009). Young and Young (1992) in the *Seeds of Woody Plants in North America* recommend treating redbud seeds in boiling water (100°C) for 60s. They also indicate that seeds have been placed in 82°C water and allowed to cool overnight, but do not indicate how effective the treatment was for alleviating physical dormancy. Hot water treatment would be preferable for scarification of large quantities of seeds because it avoids safety and disposal issues associated with sulfuric acid scarification. However, it is not known if heat treating redbud seeds to relieve physical dormancy impacts subsequent release from physiological dormancy during chilling stratification or seedling vigor during germination.

The major objective of the current study were to compare the effects of physical, hot water, and acid scarifications on seed germination and embryo growth in eastern redbud prior to and after chilling stratification.

## MATERIAL AND METHODS

Four scarification treatments were applied to redbud seeds.

- 1) Seeds of redbud were acid scarified by emersion in concentrated sulfuric acid for 40 min then rinsed with distilled water.
- 2) Physically scarification involved nicking the opposite side of the hilum using a sanding attachment to an electric drill.
- 3) Seeds were hot water treated by placing seeds in boiling water (100°C) for 60 s followed by rinsing in cool water
- 4) Seeds were hot water treated by placing seeds in hot water (100°C) and allowing them to cool overnight at room temperature.

After physical, acid, or hot water treatments approximately 50 seeds were placed in Petri dishes with two pieces of germination paper and enough water to cover the bottom ¼ of the seeds. These were stratified at 5°C for 4 weeks.

Seeds were evaluated prior to or after stratification for seed germination and excised embryo growth. Four replicates of 25 seeds or five replicates of 10 embryos were placed in single Petri dishes containing two pieces of germination paper wetted with 5 ml of autoclaved, distilled water. Each Petri dish was sealed with parafilm and

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germination was at 25°C±1 in a lighted germinator. Germination percentages were evaluated after 7 days for intact seeds and daily for 4 days for isolated embryos.

### RESULTS AND DISCUSSION

All scarification treatments (physical, acid, and hot water) resulted in a release of physical dormancy (Fig. 1). Embryos removed from non-stratified seeds resulted in germination above 75% following physical, acid, or hot water soak scarification (Fig. 2). However, seeds immersed in boiling water for 1 min germinated at less than 5%. The hot water soak initially had comparable germination to physical and acid treatments, but showed slower embryo germination and reduced germination following stratification (Fig. 3).

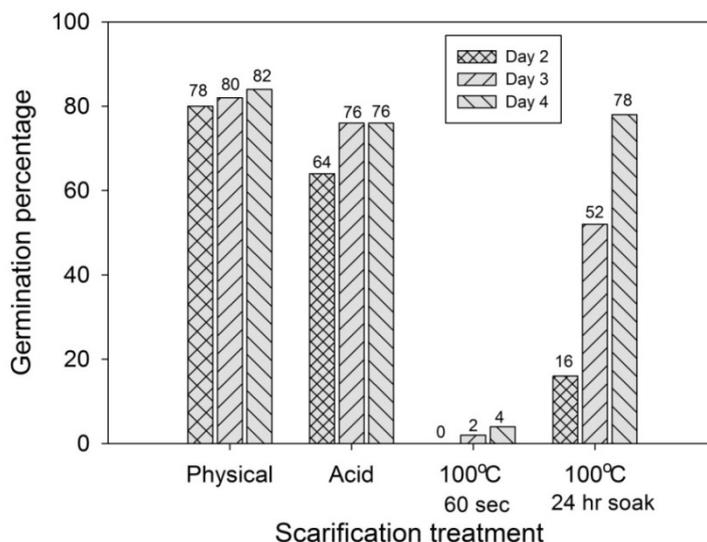


Fig. 1. Germination in isolated embryos of eastern redbud following physical, acid, and hot water scarification without chilling stratification.

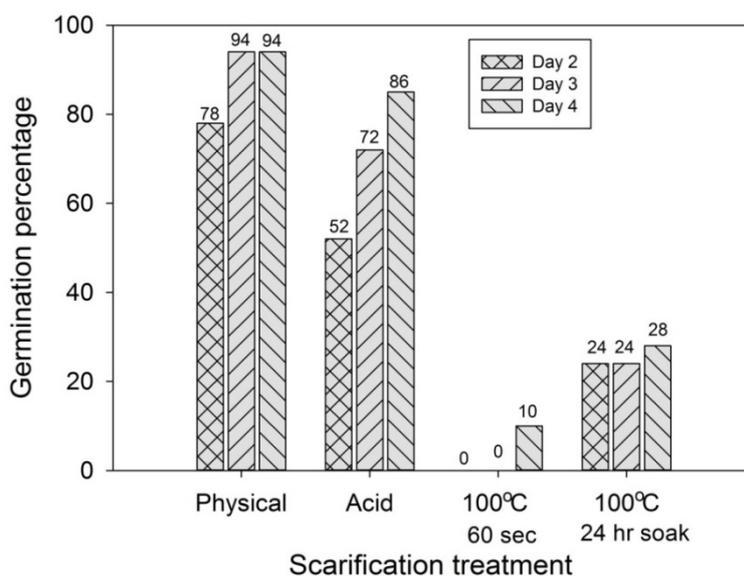


Fig. 2. Germination in isolated embryos of eastern redbud following physical, acid, and hot water scarification after 4 weeks of chilling stratification.

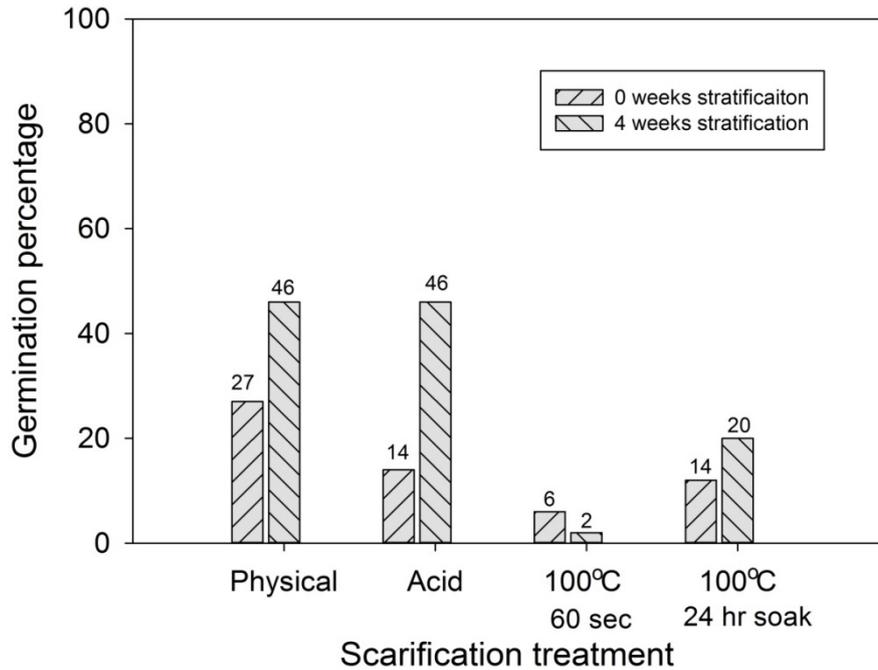


Fig. 3. Germination in intact seeds of eastern redbud following physical, acid, and hot water scarification after 0 or 4 weeks of chilling stratification.

Hot water is an effective, alternative scarification treatment to relieve physical dormancy in eastern redbud seeds. However, contrary to previous reports (Young and Young, 1992), the current results demonstrate that prolonged exposure to 100°C can damage the redbud embryo (Fig. 2) and therefore cannot be recommended as a viable scarification treatment. It is also apparent that these heat treatments predispose the seeds (embryos) to additional damage during stratification (Figs. 2 and 3). Preliminary evidence from additional ongoing research indicates that brief exposure (<15 min.) to hot water below 80°C can be effective at physical dormancy release, while not inducing embryo damage. Until this work is completed care should be taken when using hot water as an alternative to physical or acid scarification.

#### Literature Cited

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