Comparing Cold & Bleach Treatments to Improve Germination Rates of Seven Shade-Tolerant Species

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Introduction

Pollinator gardens are beneficial in protecting our pollinator populations. However, growing these gardens can be challenging, as the seeds of some native plant species are difficult to germinate. In nature, seeds often undergo natural processes that break their dormancy. Native seeds provided by local nurseries do not experience these same processes, but these processes may be mimicked artificially to improve germination rates.

Cold stratification of seeds has been replicated using varying lengths of time in refrigerators. Chemical and physical scarification can also be replicated using techniques such as sanding and treatment with various chemicals. To examine how such techniques may affect the germination rates of seeds acquired for planting at Rider University, cold stratification in a refrigerator was performed for various lengths of time for seven native plant species. Treatment with household bleach was also performed with three of those species. These methods were chosen to best allow the average citizen and amateur gardeners to improve germination rates of their seeds at home.

Methods

- Seeds of all seven species were placed in each cold treatment group: control, 7 days, 24 days, or 49 days of cold
- Seeds of Golden Alexander, Blue-stemmed Goldenrod, & Purple Joe-pye were also placed in each bleach treatment group: 1 hour, or 1 hour of bleach plus 7 days of cold
- Cold treatment seeds were stored in a refrigerator (~40°F [4°C]) for their assigned length of time
- Bleach treatment seeds were soaked in household bleach (~6% sodium hypochlorite), then rinsed in a sieve with water
- Following treatment, seeds were placed on 2 pieces of filter paper in petri dishes, with 10 seeds per dish. Dishes were arranged in front of windows during germination monitoring
- Seed dishes were watered with deionized water twice weekly, & germinated seeds were counted once weekly. Counted germinants were removed from the dishes once counted. Seeds were monitored for a total of six weeks.

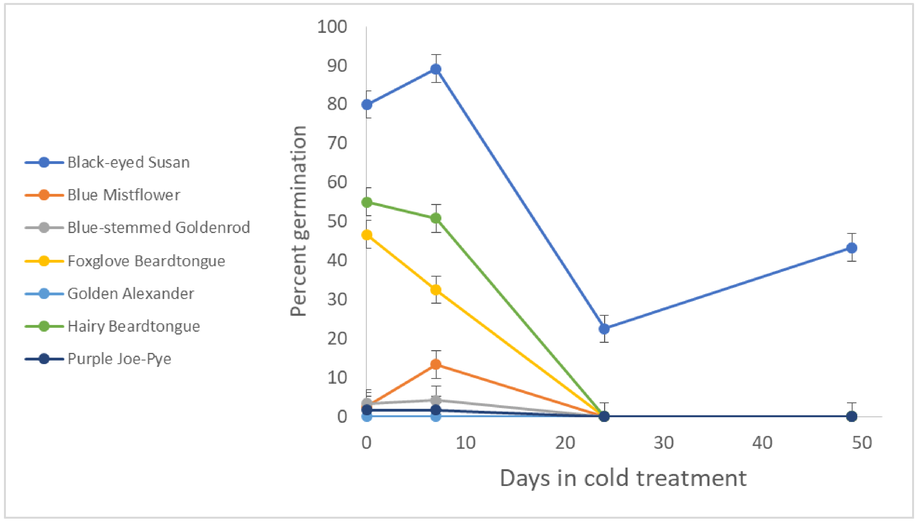


Figure 1. Percent germination (± SE) of seeds of seven native plant species in control (0 days), 7-day cold, 24-day cold, & 49-day cold treatment groups.

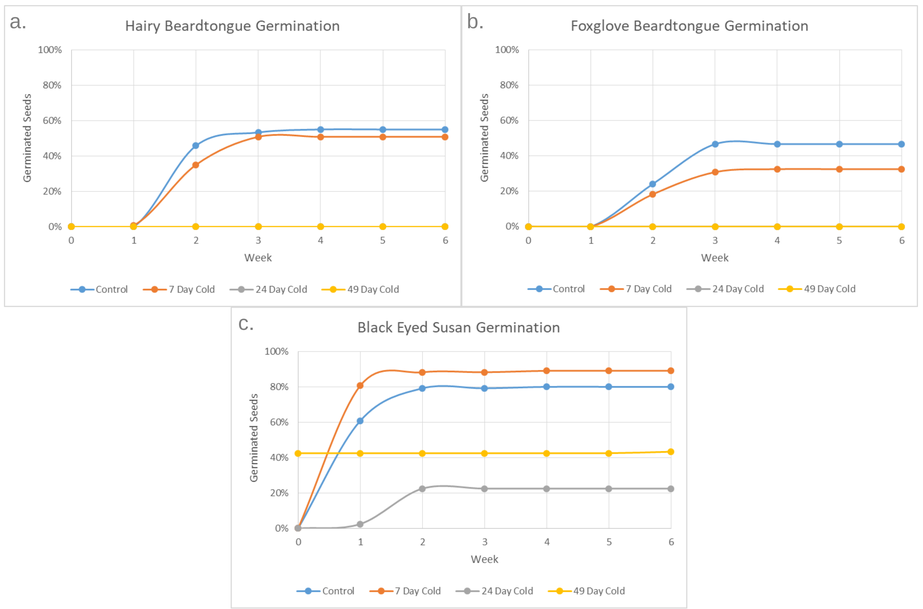


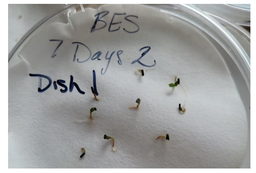
Figure 2. Percent germination of control & cold treatment seeds over time of a) Hairy Beardtongue, b) Foxglove Beardtongue, & c) Black-eyed Susan. These species had the highest rates of germination in this study.

Treatment	Golden Alexander	Blue Stemmed Goldenrod	Purple Joe-Pye
Control	0.00%	3.33%	1.67%
7 Day Cold	0.00%	4.17%	1.69%
24 Day Cold	0.00%	0.00%	0.00%
49 Day Cold	0.00%	0.00%	0.00%
Cold+Bleach	0.83%	5.08%	0.00%
1 Hr Bleach	0.83%	1.68%	1.71%

Table 1. Percent germination of species which underwent bleach treatment.

Results

- Species differed significantly in their rates of germination ($p < 0.05$, Figure 1), with Black-eyed Susan, Hairy Beardtongue, & Foxglove Beardtongue germinating at the highest rate
- The cold treatment had a significant effect on seed germination ($p < 0.05$, Figures 1 and 2), but not all species were affected by stratification treatments.
  - Most species showed the highest rates of germination under control or 7-day cold treatments
  - 7-day cold treatment may improve germination of Black-eyed Susan & Blue Mistflower, but may decrease germination of Foxglove Beardtongue



- The three species exposed to both cold and bleach, Golden Alexander, Blue-stemmed Goldenrod, & Purple Joe-pye, differed in germination rates, but there were no significant effects of cold or bleach treatment ($p > 0.05$, Table 1)

Discussion & Conclusion

- Cold stratification treatments may improve germination rates of some native species
- More work is needed to determine the best treatments for these species because of limitations within this experiment, such as a lack of growth chambers to ensure equal light exposure & issues with mold growth in the petri dishes
- Results from other studies suggest that cold treatment improves germination of Black-Eyed Susan & the two Beardtongue species, & that longer cold treatment may have been needed to see these results in the beardtongues

Literature

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