Introduction

The New England Conservation Program has stated that the highest conservation priority for the endangered New England wildflower, Northern Wild Senna (Senna hebecarpa), is to establish and maintain new populations within its historic range (Clark 2001). Understanding the factors that most influence seed germination and seedling establishment is a crucial first step in these conservation efforts.

Research Objectives

One concern for reintroduction is low germination of planted seeds (6 - 30%, Clark 2001), likely due to the species exceptionally tough and water-impermeable seed coat. Prior to germination in wild populations, seeds require scarification (loosening and penetration) while being dispersed during seasonal floods.

- **Objective 1:** Identify an artificial seed scarification technique to enhance seed germination in restoration plantings

A second concern for this species is that due to its rarity and isolated distribution, rates of self pollination are higher than normal, which can lead to a loss of fitness known as inbreeding depression.

- **Objective 2:** Quantify the impact of self pollination on fitness (seed germination and seedling emergence)

Methods

- All seeds were surface sterilized with 1:8 bleach, planted at a depth of 2 cm, and kept under sixteen hours of fluorescent light per day at 72° F
- Seed scarification experiment
  - **Control:** no manipulation
  - **Water:** 24 hours tap water
  - **Acid:** 3 minutes 70% H₂SO₄
  - **Acid, Cut:** 1 minute 70% H₂SO₄, incised corner
  - **Sandpaper:** sanded seed coat through to endosperm
- Inbreeding depression experiment
  - **Emergence:** followed sandpaper scarification treatment and planting described above
  - **Germination:** followed sandpaper scarification treatment, but grown on moist filter paper within petri dish

Results

- Germination of self (94.9%) and cross (91.7%) pollinated seeds were not significantly different ($X^2 = 0.309, P = 0.578$)
- The few non-germinating seeds were also viable, as indicated by Tetrazoleum staining resiping tissue pink (bottom right)

Conclusions

- Scarification with either acid (H₂SO₄) or sandpaper will increase rates of germination in restoration plantings
- Germination of wild Senna is not affected by self pollination, but does require scarification to break seed coat dormancy
- The consistently lower rates of emergence among self pollinated seedlings suggests that seedlings are more sensitive than seeds to the effects of inbreeding depression

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References