

# Reproductive Biology of the Endangered Wildflower *Senna hebecarpa* II: Germination and Seedling Emergence

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## 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)**

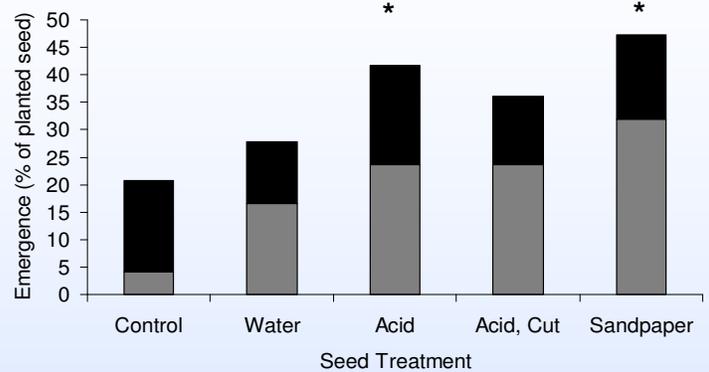
## Methods

- 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% H<sub>2</sub>SO<sub>4</sub>
  - **Acid, Cut:** 1 minute 70% H<sub>2</sub>SO<sub>4</sub>, 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

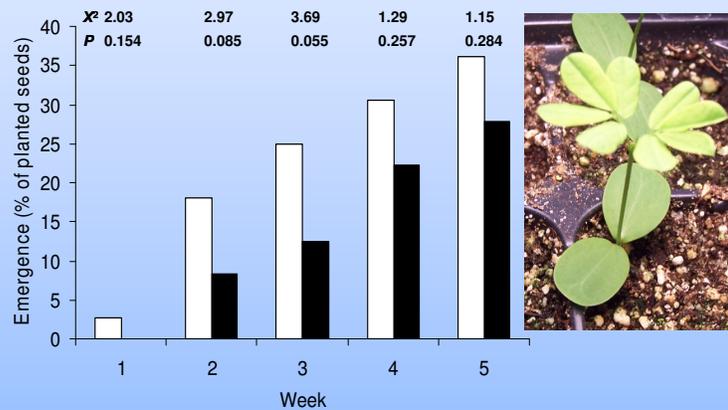
## Results

• 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 respiring tissue pink (bottom right)



**Figure 1.** Seedling emergence after week 1 (gray) and 2 (black) for each scarification treatment. Asterisks (\*) indicate a significant difference from the control based on  $X^2$  tests ( $\alpha = 0.0125$ ).



**Figure 2.** Seedling emergence among self (black) and cross (white) pollinated seeds. Cross pollination yielded higher emergence, but weekly differences were not statistically significant ( $X^2$  and  $P$  values above each histogram).

## Conclusions

- Scarification with either acid (H<sub>2</sub>SO<sub>4</sub>) 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

## Acknowledgments

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## References

Clark, F. H. 2001. *Senna hebecarpa* (Northern Wild Senna) Conservation and Research Plan. New England Plant Conservation Program, Framingham, Massachusetts, USA (<http://www.newfs.org>)