Reproductive Biology of the Endangered Wildflower *Senna hebecarpa* I: Pollination and Fecundity

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Introduction

Northern Wild Senna (*Senna hebecarpa*) was once widespread throughout New England, but is now rare and endanger of extinction throughout much of its native range. In New Hampshire, the plant has been classified as endangered and critically imperiled statewide (NH rare plant list 2008). Little is known about the biology of this species, which reproduces asexually via vegetative ramets (clonal stems) and sexually by producing seeds from bee-pollinated inflorescences. Given the plant's rarity, genets (genetically distinct individuals) are often isolated and prone to self pollination between clonal ramets, which can lead to a loss in fitness due to higher than normal levels of inbreeding (i.e. inbreeding depression).

Research Objectives

- Document flowering and fruiting phenology
- Quantify impact of inbreeding depression on fecundity

Methods

- Study site - Amherst Country Club, Amherst, NH
- Phenology - 17 genets monitored from 15 July to 10 August 2007
- Pollination treatments - 20 genets per treatment in a nested design:

Hand pollinated v. Open pollinated
Cross v. Selfed Emasculated v. Control

- Analysis of variance on fruit set and seed set tested using the General Linear Model = hand + selfed (hand) + emasculated (hand)

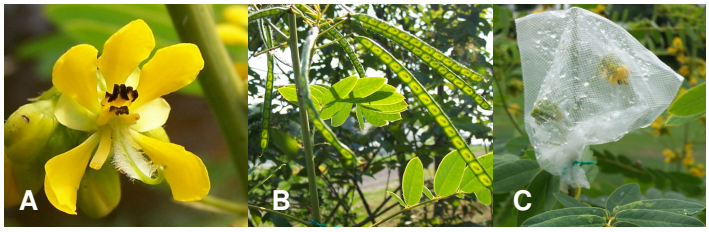

Figure 1. A. Emasculated flower B. Seed pods C. Insect enclosure

Results

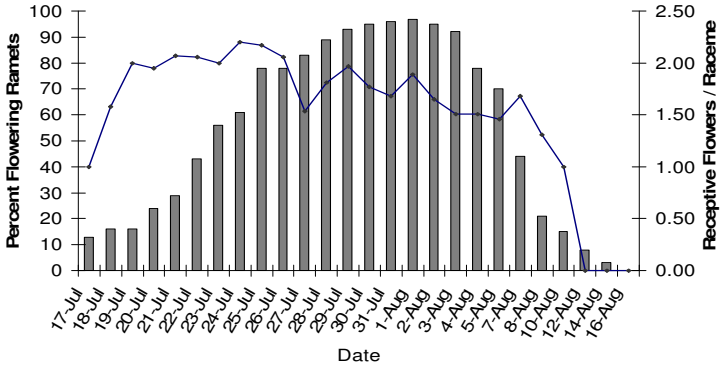

Figure 2. Flowering phenology of *S. hebecarpa*, showing the percentage of ramets flowering in the population (bar) and the average number of receptive flowers per raceme (line).

Results

- Wild Senna is not agamospermous; pollinator-excluded flowers produced no fruits
- Flowering (figure 1) and fruiting was highly synchronous. Fruits set by 16 August and ripened through October.
- Self pollination produced a moderate reduction in fruit set *(F*=3.60, *P*=0.062), but had no impact of seed set (*F*=0.45, *P*=0.505) (Figure 3)

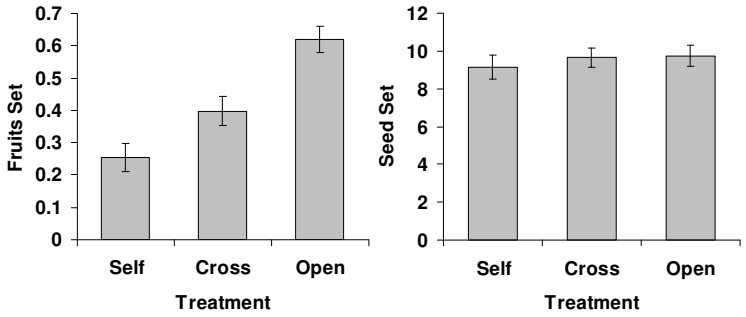

Figure 3. Effect of pollination treatment on fruit set (fruits / flower) and seed set (seeds / fruit) in *S. hebecarpa*.

Conclusions

- Synchronous flowering within multiple ramets facilitates self pollination, especially among isolated genets
- Reduced fruit set due to inbreeding depression may be limiting the recruitment of new sexually-produced genets into the population
- Management efforts that supplement small populations with additional genets will promote cross pollination and reduce the impact of inbreeding depression.

Acknowledgments

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References

- Rare Plant List for New Hampshire. New Hampshire Natural Heritage Bureau. 2008. (http://www.dred.state.nh.us/divisions/forestandlands/bureaus/naturalheritage/index.htm)