

The evolution of self-fertilization in *Brassica rapa*: a pollination trial

Molly Dunn, Mentor: Dr. Steven Franks

Louis Calder Center - Biological Field Station, Fordham University, Armonk, NY

Abstract

Brassica rapa is widely considered a self-incompatible plant, but contemporary studies show an increase in self-pollinating plants, suggesting that selfing can evolve in environments that lack pollinators as a means for outcrossing. This study investigates the level of selfing in *Brassica rapa* under such conditions. To test the plant's self-compatibility, three pollination treatments (outcrossing, manual self-fertilization, and autonomous self-fertilization) were set up in climate chambers using *Brassica rapa* fast plants. Data analysis was done by collecting and weighing seedpods produced by each individual in its respective treatment. A relatively high degree of selfing was discovered in both manual and autonomous self-fertilization treatments (recording 51.6% and 29.7% seedpod production respectively), compared to 81.3% of cross-pollinated individuals that produced seedpods. The effect of pollination treatment on seed mass per individual approached significance ($p=0.057$); however, the study successfully revealed a level of self-compatibility that will lead to further development of the project to select for selfing in *Brassica rapa*.

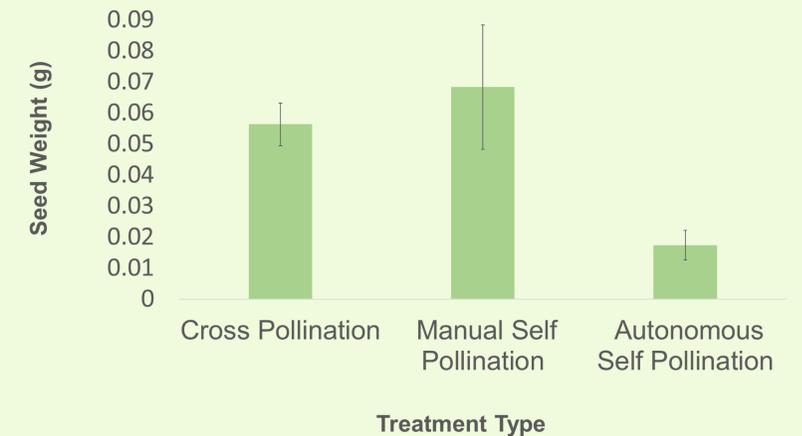
Methods Continued

- Two trays per treatment
- Trays contain 32 potted plants
- 60 fast plants and 4 sterile males (+/- controls) per treatment
- Pollination bags prevent cross-contamination and pollinators between plants and treatments



Results Continued

Average Seed Mass per Individual per Treatment:



ANOVA test shows results approaching significance ($p=0.057$)

Question

Does *Brassica Rapa* have the ability to self-fertilize in conditions that do not permit cross-pollination?

Advantages and Disadvantages of Selfing

- Advantages
 - 100% of genes conferred to next generation
 - Reproductive assurance
- Disadvantages
 - Lack of genetic variation
 - Possible inbreeding depression

Methods

Study Organism:



- ❖ *Brassica rapa* (Brassicaceae) fast plant
- ❖ Field mustard
- ❖ Typically, self-incompatible
- ❖ Rapid flowering time of 14 days

• 3 Pollination treatments

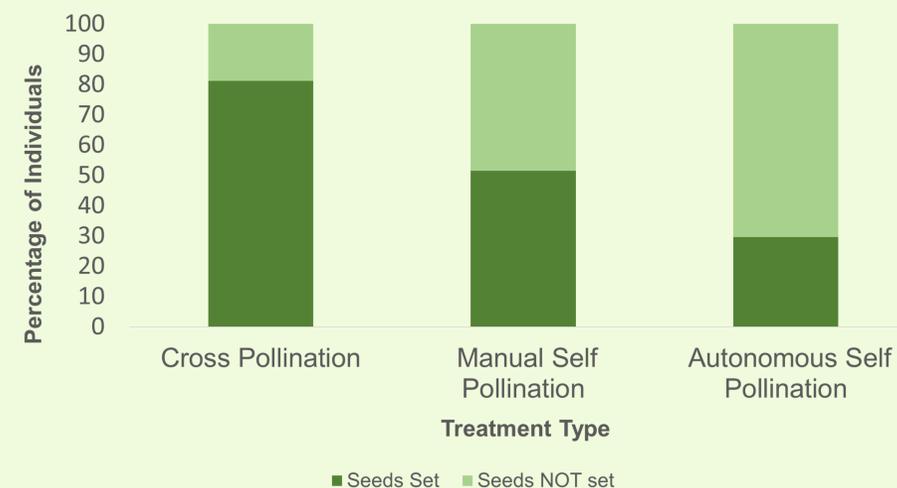
- Cross Pollination
- Manual Self-Pollination
- Autonomous Self-Pollination

• 2 Climate chambers

- 24hr of light
- Constant 31° C

Results

Proportion of Plants Setting Seeds:



Discussion

- Larger proportion of cross-pollinated plants set seeds than self-pollinated plants
 - Manual and autonomous
- Fast plants can self-pollinate
 - Despite an allelic self-incompatibility system, evidence found to support self-pollination in *Brassica rapa* fast plants
 - relatively high proportion of individuals
 - expect that selecting for selfing is likely to lead to even greater rates of self-compatibility

Acknowledgements

- ❖ Dr. Steven Franks
- ❖ Dr. Elena Hamann
- ❖ Stephen Johnson
- ❖ Alissa Perrone
- ❖ Petra Del Valle
- ❖ The Louis Calder Center

