Sexual Selection in Plants?

History
Plant Mating
Selective Fertilization
Sexual Selection

- Darwin’s view.
  - Separate from natural selection to explain exaggerated characters in males of a species.

- Bateman’s Principle:
  - Female reproductive success more often limited by resources.
  - Male reproduction more often limited by access to mates.
  - If the variance in male success is higher than female success then there is an opportunity for sexual selection to affect male characters that increase their ability to obtain mates.
Sexual Selection

- **Male competition (intra-sexual selection).**
  - Mating success of males is determined strictly by competitive outcomes.

- **Female choice (inter-sexual selection).**
  - Females actively choose the “best” male to sire their offspring.
  - The “good genes” hypothesis.
    - Females choose to mate with males that are more fit - more likely to survive and reproduce.
In Plants?

- History
  - “Mate Choice in Plants” Willson and Burley 1983.
  - Ensuing controversy raged through the 80’s and 90’s, and continues today.
  - Dramatic increase in the number of publications on this topic after the publication of Willson and Burley’s book.
In Plants?

- **Bateman’s principle.**
  - Floral displays increase male success more than female success (Bell 1985; Cruzan et al. 1988).
  - Around 60% of plants’ seed set is limited by adequate pollination at least sometimes (Bierzychudek 1981; Burd 1994)
Post-Pollination?

- Pollen tube competition.
  - Is there a character that selection can act on to increase tube growth rate?
  - Is there a trade-off with natural selection?

- Stylar selection.
  - Does stylar selection increase male reproductive success?
  - A simple experiment.
    - Lyons et al.
    - Cruzan 1993
Post-Fertilization

- Are ovules selectively aborted?
- Who’s in charge?
  - Does mom selectively abort ovules?
  - Do the zygotes fight it out among themselves?
Megagametophyte

- Integument
- Nucellus
- Megagametophyte
- Micropyle

MEGAGAMETOPHYTE DEVELOPMENT

MOST ANGIOSPERMS:

- ANTIPODAL CELLS (N)
- CENTRAL CELL (N+N)
- SYNERGIDS (N)
- EGG (N)

Lilium - an oddball

- MEIOSIS
- FUSION & DIVISION

- 1N
- 2N
- 3N
- ANTIPODAL CELLS (3N)
- CENTRAL CELL (3N+N)
- SYNERGIDS (N)
- EGG (N)
Fertilization

- Micropyle.
- Double fertilization.
  - Embryo
  - Endosperm
- Developing embryo.
  - Chalaza.
  - Early abortion
Post-Fertilization Ovule Abortion

- Resource allocation to ovules.
  - Source/sink relationships.
  - Auxin gradients and ovule abortion.
- Evidence:
  - Inbred ovules are more likely to abort (Rigney et al. 1993)
    - Late-acting self incompatibility?
  - Fruits with more seeds produce more auxins and are less likely to abort.
    - Is it auxin production or sink strength?
  - Seed size varies.
Sexual Selection in Plants?

- **Pollination**
  - Bateman’s Principle does not always hold.
  - Natural as well as sexual selection may affect increase display size.

- **Post-pollination.**
  - Male success does vary.
  - No conclusive evidence on characters that appear to be the result of sexual selection.
  - If pollination is inadequate, then opportunities for selective fertilization may be uncommon.

- **Post-fertilization.**
  - There does not appear to be complete maternal control of seed provisioning.
    - Seed size often varies.