Sexual Selection

We are, however, here concerned only with sexual selection. This depends on the advantage which certain individuals have over others of the same sex and species solely in respect of reproduction.

Sexual Selection

Known to be important in animals, but role in plant evolution and diversification poorly understood.

Operational Sex Ratio in Plants

Operational sex ratio in plants is strongly male biased

Each pollen grain and embryo sac (contained in a single ovule) are multicellular individuals (i.e., gametophytes) representing the sexual phase of the seed plant life cycle

Pollen is far more abundant than ovules

Thus, sexual selection should be intense

Variation in Operational Sex Ratio

Number of pollen grains competing for ovules should vary according to the number of ovules per ovary

Many ovules per ovary (weak competition)

Few ovules per ovary (strong competition)
Hypothesis

If reproductive incompatibilities arise as by-product of sexual selection, then the F1 seed production should be correlated with intensity of sexual selection.

Sexual Selection and Cross-Compatibility

Rates of protein evolution are higher in genes expressed in sexual than somatic tissue

Result is consistent across five pairs of species

No difference in rates of protein evolution among genes expressed in male versus female gametes or different cell types from sexual tissues*

*List of sex-biased genes obtained from Gossmann et al. 2014 (MBE)
Genes expressed in sexual tissues evolve more quickly in species with few ovules

Pollen-specific genes have a significantly larger difference in dn/ds ($p = 0.02$)

Same result in broader comparison

Conclusions

- Sexual selection appears to be an important and previously unappreciated driver of reproductive isolation and speciation in plants.
- The effects of sexual selection appear to be pervasive, predicting relative rates of molecular evolution for sexual and somatic genes, the strength of isolating barriers at the species level, and species richness at the level of plant families and orders.

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Collaborators:

Kate Ostevik
Daniel Ortiz-Barientos
Xing Fan