Variation in Heterospecific Pollen Receipt Among and Within Species Across the Flowering Season

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Introduction

- Plant species that share pollinators can inadvertently exchange pollen, a process termed heterospecific pollen transfer ('HPT').
- HPT may substantially reduce plant fitness, lowering seed production when flowers receive the wrong pollen and lowering siring success when pollen is delivered to the wrong species.[1]
- The strong selection pressure plants face from HPT may therefore drive floral evolution.[1]
- Current work indicates indicates that the degree of HPT can vary across species and among individuals within species, but the causes of this variation are not well understood.[2]

Fig 1: Field Site, Fort Indiantown Gap, PA

Study Questions

Here, we investigate the extent to which flowering time drives variation in HPT by examining temporal patterns of HPT for grassland co-flowering species a flowering season. We ask:

1. How much variation in heterospecific pollen receipt occurs across species?
2. How does heterospecific pollen receipt vary within species over time?

Methods

- The study was conducted across the growing season within a large grassland (~4ha) at Fort Indiantown Gap, PA in 2018 (**Fig 1**).
- We sampled stigmas bi-weekly, from 12 species across the flowering season (6 sampling weeks, ~30stigmas/spp/week, total >1200 stigmas) and stored them in ethanol until processing.
- Stigmas were vortexed in ethanol and centrifuged to dislodge pollen grains.
- Pollen grains were dyed with fuchsin and mounted on microscope slides to quantify conspecific and heterospecific pollen grains on each stigma.
- Heterospecific and conspecific grains were identified based on morphological features (Fig. 2).

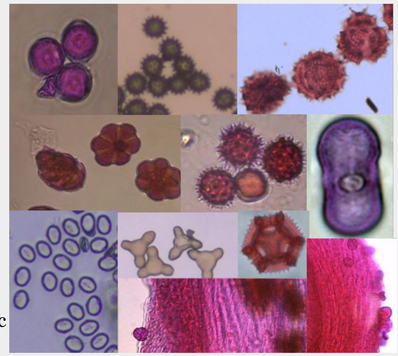
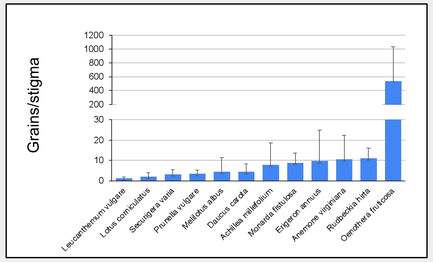


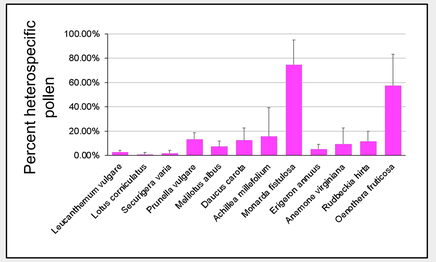
Fig 2: Pollen grains from various species at 40x

Results

There is wide variation among species in heterospecific pollen receipt.

Oenothera fruticosa receives nearly 500 heterospecific pollen trains on average, whereas *Leucanthemum vulgare* largely avoids HPT.



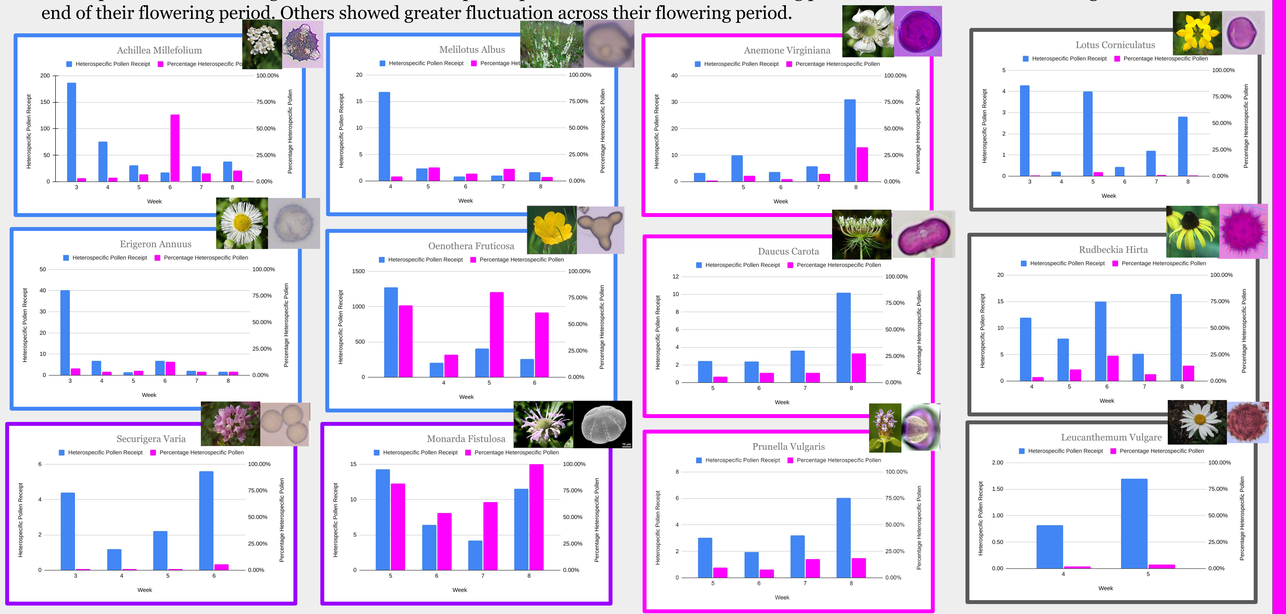


When we consider that some species receive low levels of conspecific pollen. Half of the species receive under >10% heterospecific pollen

Figures 3 & 4. Mean + SD across the flowering season for 12 species

Heterospecific pollen receipt changed over time, though the trend varied across species.

Some species received the highest amount of heterospecific pollen at the start of their flowering period, while others received the highest amounts at the end of their flowering period. Others showed greater fluctuation across their flowering period.



Conclusions

- Half of the species examined had substantial percentages of heterospecific pollen
- Given the negative impact of heterospecific pollen on seed set, HPT is likely to have a major impact on the overall flowering community.[3]
- Variation across time suggests that some species may face selection pressure to flower later, others earlier.
- With the construction of plant-pollinator networks, these findings could be used relate patterns of mutualistic interaction network structure with biologically relevant pollination outcomes.

References

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