



Style persistence as a measure of pollen limitation

Karen E. Taira^{1,2}, Lee Rodman³

Northwestern University¹, Chicago Botanic Garden², Grinnell College³

Introduction

Quantifying pollen limitation is important for understanding reproductive success in plants affected by pollinator decline and fragmentation. Style Persistence (SP), was developed in the prairie plant *Echinacea angustifolia* as a measure of pollen limitation during flowering season. The study found that styles will shrivel within 24 hours of receiving compatible pollen, but will persist up to 10 days after receiving no pollen. If SP proves an effective measure of pollen limitation in other prairie species, it has the potential to reduce the amount of experimentation needed in assessing reproductive fitness in a given population.

Study Species



Echinacea purpurea



Heliopsis helianthoides



Helianthus pauciflorus

Objectives

- Test the effect of different pollination treatments and row on the number of days styles persist
- Determine the potential for SP as a measure of pollen limitation in *Helianthus* species

Literature Cited

Aizen, M.A., L. Ashworth, and L. Galetto 2002, Reproductive success in fragmented habitats: do compatibility systems and pollination specialization matter? *Journal of Vegetation Science* 13:885-892.

Campbell, L.G. and B.C. Husband 2007, Small populations are mate-poor but pollinator rich in a rare, self incompatible plant, *Hymenoxys herbacea* (Asteraceae). *New Phytologist* 174:915-925.

Fisher, T.R. 1957. Taxonomy of the genus *Heliopsis* (Compositae). *The Ohio Journal of Science* 57(3):171.

Stephens, L.C. 2008. Self-incompatibility in *Echinacea purpurea*. *HortScience* 43(5):1350-1354.

Wagenius, S. 2004. Style persistence, pollen limitation, and seed set in the common prairie plant *Echinacea angustifolia* (Asteraceae). *International Journal of Plant Science* 165(4):595-603.

Pollination Experiment

Methods

E. purpurea and *H. helianthoides* inflorescences were randomly assigned one of three treatments: control, self-pollination, or outcross pollination. Treatments were administered and style condition recorded every third day.

Results

E. purpurea and *H. helianthoides* showed a difference among treatments. Outcross-pollination treatment showed lower mean persistence. *E. purpurea* showed an additive effect of row. *H. helianthoides* showed an interactive effect of row and treatment.

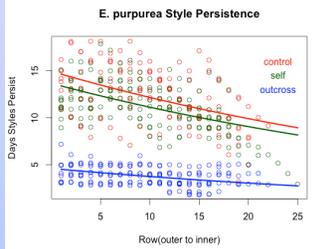


Fig 1: In *Echinacea purpurea*, there is a distinct difference in the number of days styles persisted in the outcross (mean 3.8 days). The lines show the slope of the predicted values of an additive treatment and row effect, based on a GLM.

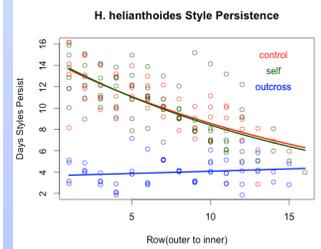


Fig 2: In *Heliopsis helianthoides*, there is a distinct difference in the number of days styles persisted in the outcross (mean 3.1 days). The lines show the slope of the predicted values of an interactive treatment and row effect, based on a GLM.

Observations

Methods

Helianthus pauciflorus

Disk floret phenology was recorded in open pollination. Photographs of style emergence were taken each day of observation. Photos were later compared and the number of days styles persisted was recorded for each inflorescence.

Results

Helianthus pauciflorus showed a difference in days style persisted in open pollination.

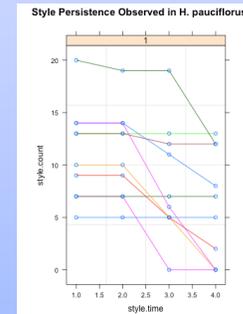


Fig 3: The number of days *Helianthus pauciflorus* styles persisted in open pollination ranged from 1 to over 4 days. This variation indicates that this would be a good species to test SP as a measure of pollen limitation.

Conclusions

Style Persistence (SP) measures pollen limitation in *E. purpurea* and *H. helianthoides*.

The number of days styles persist differs among inner and outer rows, and the row may have an effect on the treatment.

In *Helianthus* species, SP shows potential as a measure of pollen limitation.

Acknowledgements

Thanks to S. Wagenius for guidance in experimental design and statistical analysis. We would also like to thank Team Echinacea for assistance and support. This project was supported by the National Science Foundation, Grants 0545072, 0544970, & 1052165, including an REU supplement.