

Pollination of *Echinacea angustifolia*: efficiency of eight common taxa

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Background

Echinacea angustifolia is a prairie herb found in the grasslands of western Minnesota. *Echinacea angustifolia* is self-incompatible and therefore relies on pollinators for successful reproduction. The Echinacea Project has identified 26 species of solitary bees, as well as moths from other orders, that visit *Echinacea angustifolia* and may carry pollen between plants (Wagner, 2010). These insects differ in size and behavior and therefore may vary in their efficiency as pollinators.

The purpose of this study is to determine whether some pollinators are more efficient than others. *Echinacea angustifolia* exhibits style persistence such that when a compatible pollen grain is deposited on a style, that style will shrivel into its anthera in 24–48 hours. If not pollinated, it will persist for up to 9 days (Wagner 2004). We use the proportion of shriveled styles after a single pollinator visit as a qualitative measure of pollinator efficiency.

Methods

Day 1: Pollinators Excluded

We bagged heads on their first day of flowering.

Day 2: Observation

We un-bagged heads to allow a single pollinator visit and counted receptive styles.

We recorded the visit on a video camera and re-bagged the head after the visit.

Day 5: Assess Styles Shriveling

We counted the number of shriveled styles are painted the bracts subtending flowers of shriveled styles.

A Selection of the Study Species



Andrena sp. *Agapostemon virescens* Syrphid Fly *Augochlorella Melissodes* sp. *striata*

Results

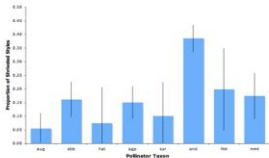


Figure 1. Pollinator efficiency measured as the pollinator taxon vs. the average proportion of styles shriveled on a head after a single pollinator visit.

Pollinator Taxa	Abbreviation	Length (mm)	Number of Observations
<i>Augochlorella striata</i>	aug	7	17
"Small Black Bee"	sbb	6-10	34
<i>Halictus</i> sp.	hal	7-11	5
<i>Agapostemon virescens</i>	agp	11	36
Syrphid Fly	sfp	10-12	7
<i>Andrena</i> sp.	and	7-15	96
Female <i>Melissodes</i> sp.	mel	10-15	8
Male <i>Melissodes</i> sp.	mms	10-15	21

Table 1. Pollinator taxa, corresponding abbreviation (used in Figure 1), body length, and number of observations used for analysis.

Discussion

—Data was collected over four separate years (2010, 2011, 2013, and 2014)

—In 2014, we observed 136 pollinator visits from July 17th until August 17th

—Pollinators show distinct different proportions of styles (Figure 1, generalized from results, $df = 7, p < 0.001$).

—*Andrena* sp. shriveled right from the proportion of styles in *Augochlorella striata* ($p < 0.001$).

—*Andrena* sp. were more efficient than all other taxa ($p < 0.001$) except Female *Melissodes* ($p = 0.02$). However, *Andrena* sp. shriveled twice the proportion of styles as Female *Melissodes* than there still appears to be a trend that *Andrena* sp. is more efficient than Female *Melissodes*.

—Pollinator length may contribute to pollinator efficiency.

—*Andrena* will be returned to see for genetic diversity of pollen carried by pollinators.

Literature Cited

Wagner, S and Lyon, SP. 2010. Ecology. 96:733-742

Wagner, S. 2004. International Journal of Plant Sciences. 365:95-105

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