



Fitness and morphological variation in native, non-native, and hybrid *Echinacea* seedlings

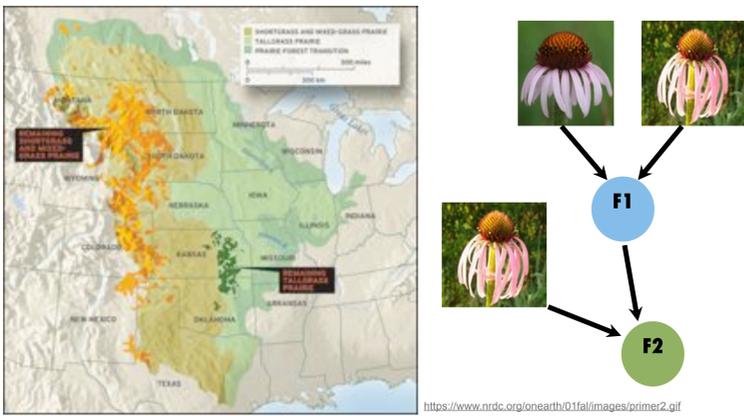
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INTRODUCTION

Echinacea angustifolia is a perennial purple coneflower, native to MN, that is experiencing population declines in response to habitat loss and fragmentation. Recently, a non-native species, *E. pallida*, was introduced into prairie remnants in Kensington, MN. Hybridization and introgression by non-native species with native flora may be destructive to the genetic integrity of native populations. Adverse effects may include changes in morphological and phenotypic traits.



HYPOTHESIS

The F1 generation from the four crosses will exhibit variation in survival, emergence, cotyledon characteristics, and first true leaf early in seedling growth.

PRE-GERMINATION

GERMINATED ACHENES

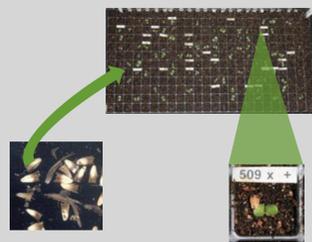
PLANTED ACHENES

MEASUREMENTS

ANALYSIS

METHODS

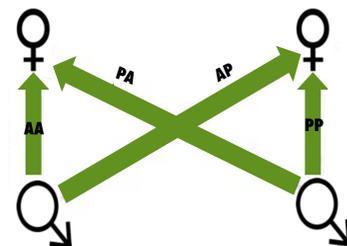
- Kensington, MN
- Part of a previous experiment
- 515 Achenes
- 4 cross types



NATIVE



NON-NATIVE



RESULTS

A)

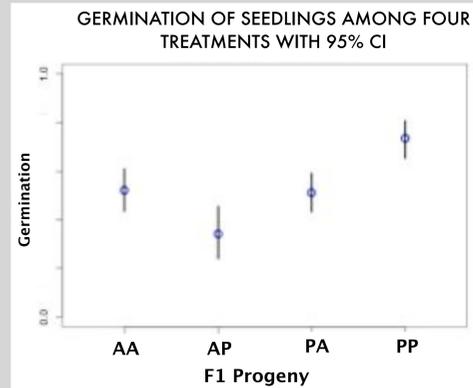


Figure 1. Total emergence of each of the four cross types (n=515, p<0.001). Total emergence included seedlings that emerged at any point in the experiment.

B)

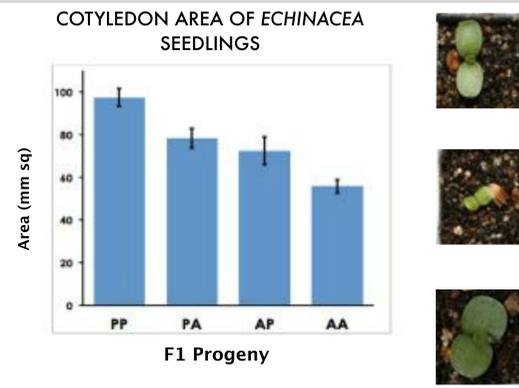


Figure 2. Mean cotyledon area of each of the four cross types (p<0.0001). Graphs for other cotyledon measurements showed similar results.

C)

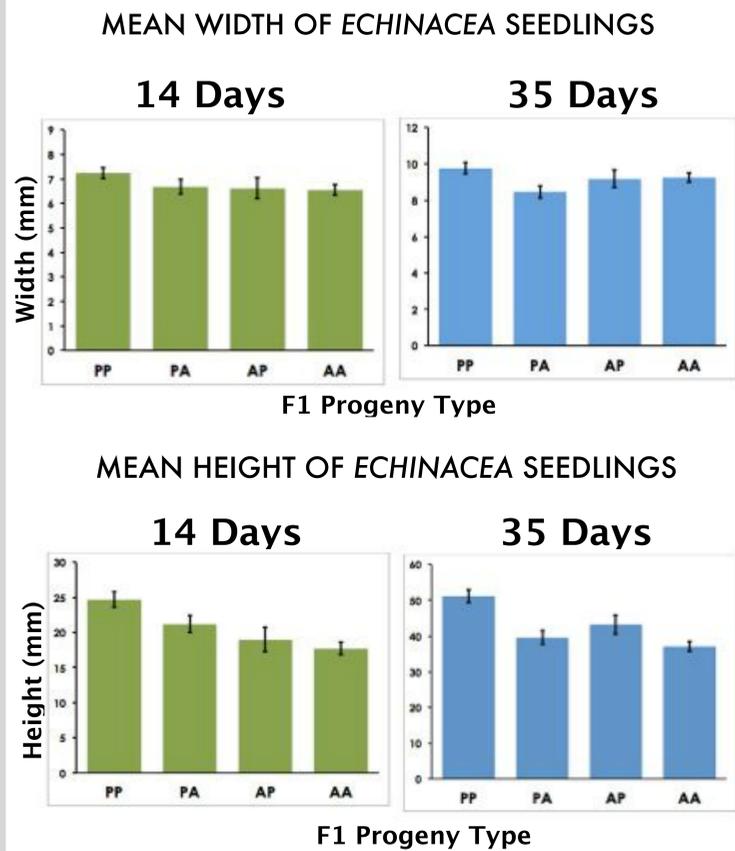


Figure 3. Mean heights and widths of first true leaf of F1 progeny at two ages based on a linear model in ANOVA (n=276 or 278). **Top** Mean width of seedlings at 14-days-old (p = 0.01983) and 35-days old (p < 0.001). **Bottom** Mean height of seedlings at 14-days-old (p < 0.001) and 35-days-old (p < 0.001).

DISCUSSION

- No apparent difference between exchange of maternal or paternal characteristics
- Different crosses show differences in morphology
- PP may be a good competitor
- Potential for introgression
- Applies to early growth

NON-NATIVE → NATIVE

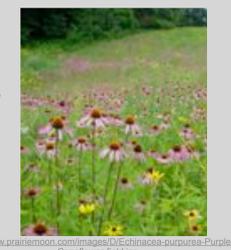
FUTURE STUDIES

- Planted summer 2013
- Track growth and survival of individual plants
- Measure differences in morphology and survival from early growth to maturity
- Additional morphological characteristics:
 - Ray Length
 - Trichome abundance
 - Flower color
 - Flowering time



CONSERVATION IMPLICATIONS

- Can be applied to other habitat types
- Good model species
- Interconnectedness of habitat size, non-native species, and hybridization
- Competition is a major effect of non-native introductions, strengthened by fragmentation



REFERENCES

Rhymer, J. M., & Simberloff, D. (1996). Extinction by hybridization and introgression. *Annual Review of Ecology and Systematics*, 83-109.

Ramirez-Rodríguez, R., Tovar-Sánchez, E., Jimenez Ramirez, J., Vega Flores, K., & Rodríguez, V. (2011). Introgressive hybridization between *Brahea dulcis* and *Brahea nitida* (Arecaceae) in Mexico: evidence from morphological and PCR-RAPD patterns. *Botany*, 89(8), 545-557.

Wagenius, S. (2006). Scale dependence of reproductive failure in fragmented *Echinacea* populations. *Ecology*, 87(4), 931-941.

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