Examination of interactions between *Sida hermaphrodita* and *Phragmites australis*: Seedling growth and mycorrhizal colonization

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Introduction

- Endangered species: *Sida hermaphrodita*
- Global Conservation Rank: Vulnerable (G3)\(^1\,2\)
- Canadian National Designation: Critically Imperiled (N1) (Fig. 1)\(^1\,2\,3\)
- Potential threat: loss of habitat due to invasive grass: *Phragmites australis* (Fig. 2)\(^3\,4\)
- Highly competitive species\(^5\,6\)
- Invasiveness attributed to Allelopathy\(^7\)
- Root Allelopathy\(^8\,9\)
- Allelochemical Phytotoxicity\(^10,11\)
- Endophytic Allelopathic Exclusion\(^6,12,13\)
- Additional impacts may be through relationship with arbucysar mycorrhizal fungi (Fig. 3)\(^12,14,15\)
- Effects on plant growth expected to be through belowground processes

Objectives

- Objective 1: Determine how seedling mortality and arbuscular mycorrhizal colonization of *S. hermaphrodita* in the field relates to the presence/absence of *P. australis*.
- Objective 2: Determine how chemical compounds and microorganisms present within the soils associated with *S. hermaphrodita* and *P. australis* affect the performance and arbuscular mycorrhizal colonization of both plants.

Methods

**Objective 1**

- Field Vegetation Survey
  - 28 1m x 1m quadrats at Taquanyah Conservation Area (Fig. 4)
  - Seeding emergence of *S. hermaphrodita* was quantified

- Fungal Colonization Statistical Analyses
  - Analysed using 2-way ANOVA

**Objective 2**

- Field Soil Core Collection
  - 5 transects were set at Taquanyah Conservation Area (Fig. 5)
  - 2 undisturbed soil cores were taken from each corner

- Greenhouse Study
  - Plant Growth
    - Seeds of either *S. hermaphrodita* or *P. australis* were grown in each core (Fig. 6)
    - Maintained in a greenhouse for 12 weeks
  - Harvest Measurements
    - Plant Performance
    - Fungal Colonization\(^16\)

Results & Discussion

**Objective 1**

Contrary to initial hypothesis, results indicated that proximity to *P. australis* has no significant effect on the mortality of *S. hermaphrodita* seedlings (Fig. 7).

*S. hermaphrodita* seedlings were colonized by AM fungi at all sites with no significant reductions in colonization associated to proximity to *P. australis* (P<0.5).

**Objective 2**

Contrary to initial hypothesis, results from the greenhouse study indicated that *P. australis* significantly out-performed *S. hermaphrodita* across all sites and that the seedlings of both species perform significantly best in the soils obtained from pure stands of their competitor (Fig. 8).

Conclusions

Results suggest that *P. australis* is not negatively impacting the performance of *S. hermaphrodita* through belowground interactions. Aboveground interactions will need to be examined to fully understand the potential threat of *P. australis* on *S. hermaphrodita*’s limited distribution.

Acknowledgements

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