

# Effects of Competitor Identity on the Rhizosphere



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## Introduction

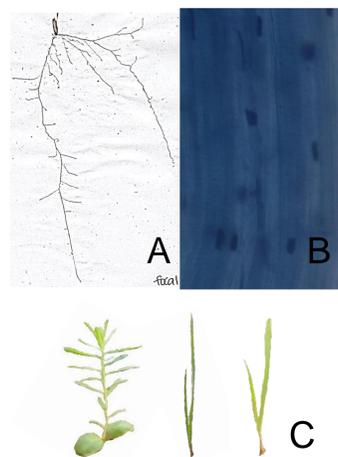
- Belowground competition has a stronger effect than aboveground competition and a greater impact on the survival of competing species<sup>1,2</sup>.
- In response to belowground competition, plants experience plastic responses in root morphology and physiology, which are important in increasing competitive ability<sup>3</sup>.
- Competition is a factor in determining community structure and is critical in landscape restorations.
- Evaluating the competitive ability of native species used in restoration is vital for rehabilitating communities.
- We compared the competitive abilities of a native forb, *Linum lewisii* (LILE), a native grass, *Pascopyrum smithii* (PASM), and an invasive grass, *Bromus tectorum* (BRTE).

## Hypotheses

- Competition will be most intense 1) where the invasive is grown with both natives, 2) where *Linum lewisii* is competing with itself, and 3) where *Pascopyrum smithii* is competing with *Linum lewisii*.
- In these treatments there will be lower soil organic matter, higher fungal infection, and increased root mass fraction.

## Methods

- Six treatments with 3 plants each were planted along with single plant control groups.
- Plants were harvested after four weeks and root data was collected.
- Roots were stained with trypan blue and viewed at x40 magnification.
- Soil organic matter was determined by loss on ignition.
- An ANOVA was performed in R to determine significance.



**Figure 1.** (A) Root system of PASM. (B) Mycorrhizal structures on PASM root. (C) Three species tested (left to right) LILE, PASM, BRTE.

## Results

### Root Morphology

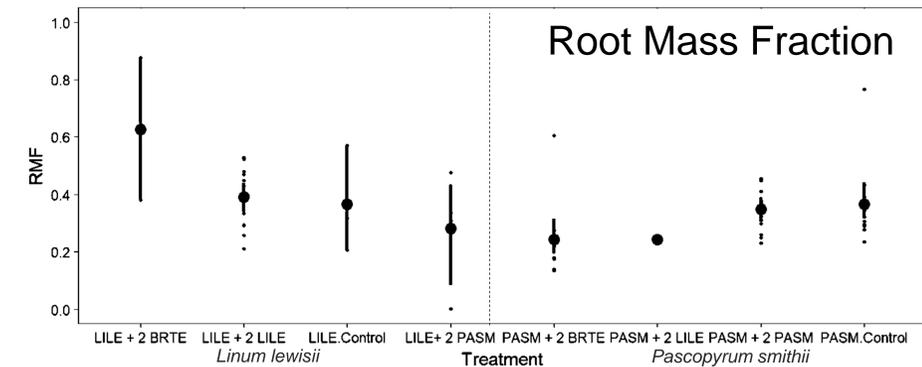
- Root mass fraction (RMF) increased when LILE was with BRTE and decreased when PASM was with BRTE (Fig. 2).
- RMF decreased when natives competed with each other.
- RMF did not change when natives competed with themselves.
- Number of root tips did not vary between treatments (Fig. 3).

### Soil Organic Matter

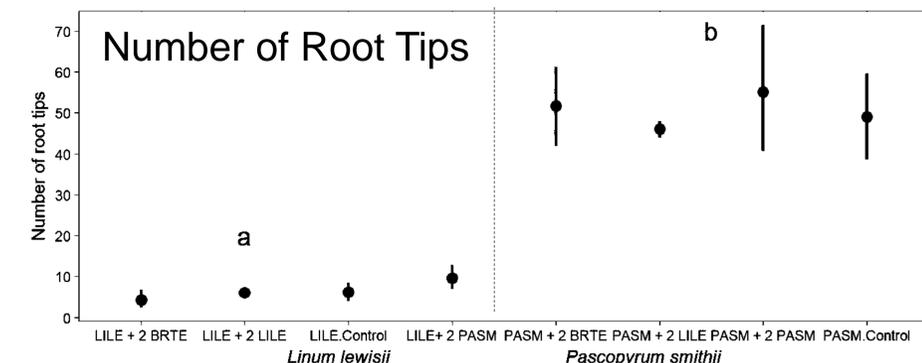
- Soil organic matter (SOM) did not vary between treatments (Fig. 4).

### Mycorrhizal Fungi

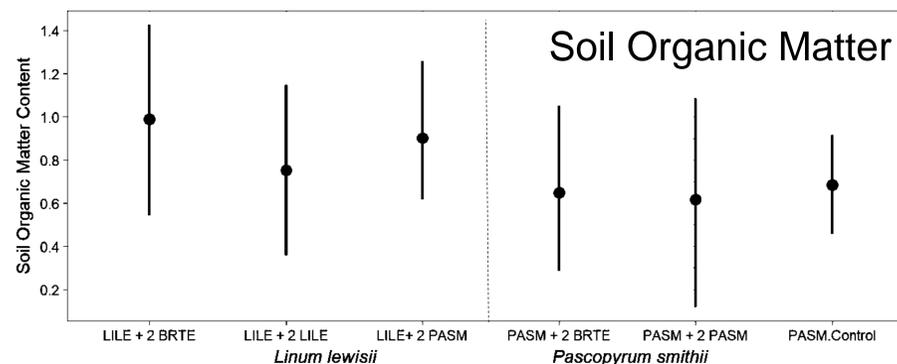
- Arbuscular mycorrhiza fungi (AMF) infection was lower where natives were competing with each other and with themselves (Fig. 5).



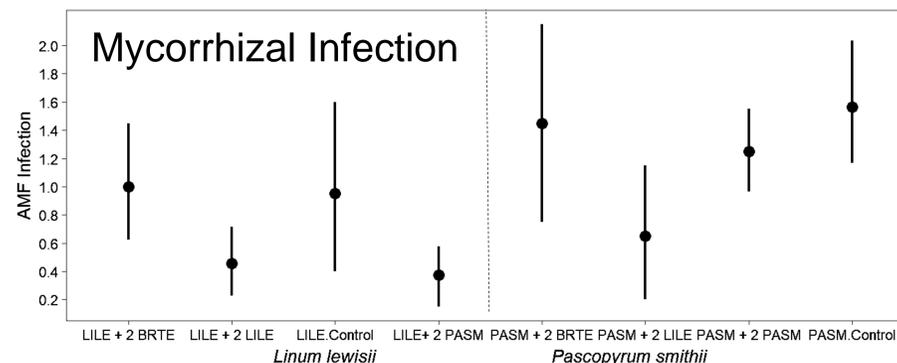
**Figure 2.** Root mass fraction by treatment.



**Figure 3.** Number of root tips by treatment. Letters show significant difference.



**Figure 4.** Soil organic matter by treatment.



**Figure 5.** Arbuscular mycorrhizal fungi (AMF) infection by treatment..

## Conclusions/Discussion

- LILE had a stronger competitive response in RMF than PASM when competing with BRTE.
- Increases in RMF and not in number of root tips indicates that root length or diameter are increasing rather than number of roots.
- Both natives had reduced RMF when grown together, indicating lower competitive response.
- AMF infection does not change where natives are competing with the invasive, indicating that mycorrhiza do not associate with the invasive.
- AMF infection is lower where natives are grown together, indicating shared AMF.
- We found evidence supporting the hypothesis that neighbor identity has effects on competitive ability through changes in RMF and AMF infection.

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## References

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