The Effects of Density in a Three-Species System of Texas C₄ Grasses

Presenter: Ann Adams
Collaborators: Avva Bassiri-Gharb and Cassandra Alvarado
Co-authors: Dr. Kelly Lyons and Dr. Eddy Kwessi
Trinity University, San Antonio
Integrated Research in Biomathematics (IRBM)
Field Observation

Invasive species have been homogenizing previously native grass plots since their introduction in the early 20th century.
Niche Theory

Niche Overlap

Direct Competition

Niche Shift

Coexistence

No Niche Shift

Extirpation

Facilitation
Why should we care?

- Importance to restoration of native species in South Texas grasslands
- Lack of information on more than two species interactions in C4 grasses
Overall Questions

Which species, or species combinations, best suppress KR?
Overall Questions

How does (spatial) density affect a three-species system?
Hypothesis

The best competitor against KR will be species whose:

1. niche overlaps with that of KR
2. growth is minimally or positively affected despite this.
Experimental Design

Focal native species:
• sideoats grama (*Bouteloua curtipendula*)
• little bluestem (*Schizachyrium scoparium*)

Focal invasive species:
• King Ranch bluestem (*Bothriochloa ischaemum*)
Experimental Design

Pot diameters: 4”, 3”, and 2”

Species Combinations x Pot sizes x Replicates

(10)(3)(5)= 150 total pots
Experimental Design
Results

KR Root Length and Shoot Height x Growing Conditions in 2" Pots

KR Root Length and Shoot Height x Growing Conditions in 4" Pots
Results

KR Biomass x Growth Conditions in 2” Pots

Growing Conditions

- 1 Spp., Density 1
- 1 Spp., Density 9
- 2 Spp., Density 9
- 3 Spp., Density 9

Biomass (mg)

- above ground (p = .012; $r^2 = .082$)
- below ground (p = .007; $r^2 = .142$)
- total (p = .0032; $r^2 = .110$)

KR Biomass x Growth Conditions in 4” Pots

Growing Conditions

- 1 Spp., Density 1
- 1 Spp., Density 9
- 2 Spp., Density 9
- 3 Spp., Density 9

Biomass (mg)

- below ground (p = .002; $r^2 = .093$)
- above ground (p = <.0001; $r^2 = .212$)
- total (p = <.0001; $r^2 = .197$)
Results

**KR Aboveground Biomass x Density**

- Average AG BM (mg)
- Pot Size (in)
- KR Aboveground Biomass x Density
- KR w/ LBS
- KR w/ SOG
- KR w/ LBS+SOG

**KR Shoot Length x Density**

- Average Shoot Length (cm)
- Pot Size (in)
- KR Shoot Length x Density
- KR w/ LBS
- KR w/ SOG
- KR w/ LBS+SOG

* p<0.05
Results

KR Belowground Biomass x Density

KR Root Length x Density

* p<0.05
Conclusions

• Relative to LBS, SOG
  – High Density: better suppresses KR belowground
  – Low Density: better suppresses KR aboveground

• More species better limits the fitness of KR

• SOG appears to have a greater effect on KR fitness than LBS
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QUESTIONS?