Biomass Yield of Five Native Perennial Warm Season Grasses

Angela E. Lee[1], John L. Reilley[2], Barry D. Lambert[1,3], James P. Muir[3]

[1] Tarleton State University, Department of Animal Sciences, Stephenville TX

[2] USDA-NRCS "Kika" de la Garza Plant Materials Center, Kingsville TX

[3] Texas AgriLife Research, Stephenville TX

Abstract

There is little biomass yield information available for native, perennial warm season grasses under cultivated conditions. This information is needed to promote their use as a cellulosic biofuel feedstock. The majority of grass species currently proposed as bioenergy crops are non-native and could become invasives. In a study established in 2007, shortspike windmillgrass (*Chloris subdolichostachya* Muell.), plains bristlegrass (*Setaria vulpiseta* Scribn. & Merr.), multiflowered false rhodesgrass (*Chloris pluriflora* Fourn.), longspike silver bluestem (*Bothriochloa saccharoides* var. *longipaniculata* Gould), and pink pappusgrass (*Pappophorum bicolor* Fourn.) of seed collected in south Texas were transplanted into plots at the Stephenville Texas AgriLife Research Center receiving no fertilizer or 67 kg N ha^{-1} yr^{-1} conditions. During a season with >1,000 mm rainfall, fertilizer increased biomass yields only for multiflower false rhodesgrass (P=0.02) and shortspike windmillgrass (P=0.08). Within the fertilized treatment, multiflower false rhodesgrass had the greatest yield (14,500 kg ha^{-1} yr^{-1}) and plains bristlegrass had the least (4,500 kg ha^{-1} yr^{-1}) while shortspike windmillgrass and pink pappusgrass were intermediate. These results are preliminary because they cover only the establishment year and a year with exceptional rainfall, so the experiment is ongoing.

Objectives

- **Document the biomass production of five native Texas warm season grasses.**
- **Determine the effect of low levels of N fertilizer on the biomass yield.**

Introduction

- **There is little biomass yield information available for native Texas warm season grasses.**
- **This information is needed to promote their use as a cellulosic biofuel feedstock.**
- **Many species currently proposed as bioenergy crops are non-native (introduced) and can become potentially invasive.**
- **Shortspike windmillgrass, plains bristlegrass, multiflower false rhodesgrass, longspike silver bluestem, and pink pappusgrass are the focus of this study.**

Advantages for Using Native Perennial Grasses as a Biofuel Feedstock

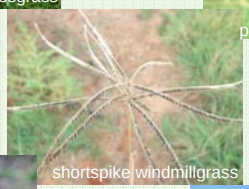
1) Adapted to local edapho-climatic conditions.
2) Reduced chance of becoming invasive.
3) Productive in low-input systems.
4) Consume less fossil fuel to cultivate.

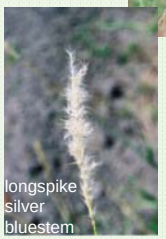
Materials and Methods

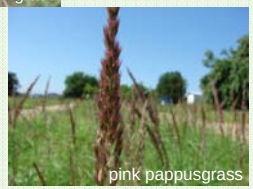
- **Grasses were planted from seed in a greenhouse in Kingsville, TX.**
- **Each species was transplanted into 3.4x6.1m plots (220 plants per plot).**
- **Plots received either no fertilizer or 67.2 kg N ha^{-1} in a single spring application.**
- **No irrigation was applied to plots.**
- **Plots were mechanically kept free of weeds**
- **Sub-samples of 20 plants per plot were harvested monthly using hand clippers (representing an area of 2.55m^2).**
- **Sub-samples were weighed and dried at 55°C, then re-weighed to determine dry matter adjusted yield.**


multiflower false rhodesgrass

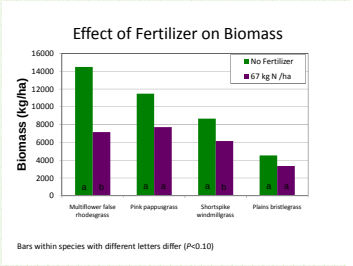

plains bristlegrass

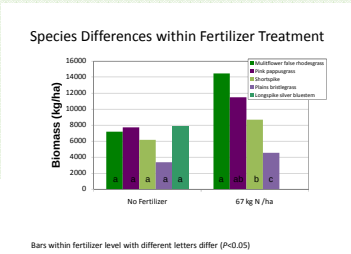

shortspike windmillgrass

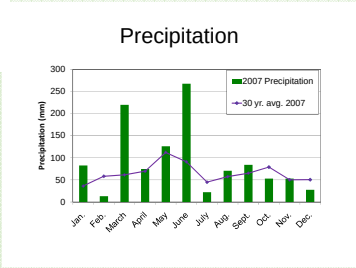

longspike silver bluestem


pink pappusgrass

Results







Conclusions

- **Fertilizer increased biomass production of multiflower false rhodesgrass and shortspike windmillgrass.**
- **Within the no fertilizer treatment, there was no difference among species.**
- **Within the 67 kg N ha^{-1} fertilizer treatment, multiflower false rhodesgrass had the greatest yield, plains bristlegrass had the least, and shortspike windmillgrass and pink pappusgrass had intermediate yields.**
- **These results are preliminary because they cover only the establishment year and a high rainfall year.**

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