

Yield of Eastern Gamagrass with and without Big Bluestem and Switchgrass

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Introduction

Eastern gamagrass is one of the most palatable and nutritious of the warm season grasses and can be used for hay and pasture. It is typically planted with a corn planter due to its seeding depth requirement. This results in row spacings of around 30 or 15 inches. In the Northeast these row spacings result in late canopy closure which reduces the optimum capture of sunlight for the crop and allows for weeds to become established competing for moisture and sunlight. The use of mixed plantings of big bluestem and switchgrass may help fill in between and within the rows of the eastern gamagrass increasing yields and helping to reduce weed establishment. This study was set up to monitor the competition between switchgrass and big bluestem on eastern gamagrass.

Materials and Methods

The plots were located on a farm in Clarion County Pennsylvania at an elevation of 1480 ft on a Cookport channery silt loam soil with a 2 – 3% grade. The soil tested optimum for phosphorus and potassium with a pH of 5.8 prior to the addition of 2.2 tons/ac of high magnesium lime.

The plots were conventionally tilled then planted on 6/1/03 with 3.5 lb/ac PLS of "Pete" eastern gamagrass. One half of the plot was planted to the gamagrass in 30 inch rows at 3.5 lb/ac PLS and the other half was planted after recalibration into 15 inch rows by double planting. Perpendicular to the gamagrass rows 'Cave-In-Rock' switchgrass (4 lbs/ac bulk) and 'Niagara' big bluestem (5 lb/ac bulk) were planted with a Truax drill. Control plots of the gamagrass without companion species were left unplanted. The resulting 18 x 50 ft plots were replicated four times.

On 6/23/05 biomass samples were collected from two 2x2 ft squares of switchgrass and big bluestem in association with the gamagrass treatments. A subsample was taken of all species from one replication at this time for forage quality analysis. The gamagrass samples were collected from 25 ft² area. The plots were sampled again on 6/20/06 for biomass calculation.



Fig. 1 Eastern gamagrass and switchgrass, 6/26/06

Results

In 2005 there was a trend toward increased first cutting gamagrass yields from the control plots which were in 15-inch rows with 1.33 t/ac compared to the 30-inch rows with 0.89 t/ac. There were on average more plants cut in the same 25 ft² area for the 15-inch row plots, 13.3 compared to 10.8 plants for the 30-inch row plots. This resulted in the increase yield for the 15-inch row spacing over the 30-inch row spacing in 2005. In 2006 this difference was eliminated with the 30 inch row actually yielding higher 1.28 t/ac compared to 1.18 t/ac from the 15-inch row. In 2006 the plant number was difficult to count due to merging and increased growth of the crowns.

In 2005 and 2006 there were lower gamagrass yields from the plots with switchgrass and big bluestem, (Fig. 1 & 2) with gamagrass yields averaged over both row spacings and species treatments of 0.62 t/ac and .69 t/ac respectively compared to gamagrass monocultures (Fig. 3) at the two row spacings averaging 1.11 t/ac and 1.23 t/ac. In 2006 these results were statistically significant, see Table 1 & 2.

In 2005 the switchgrass had the highest yield even when grown with the gamagrass with an average across both gamagrass row spacings of 1.73 t/ac compared to 0.96 t/ac for big bluestem. In 2006 the switchgrass biomass decreased; when sampled in areas adjacent to the gamagrass at both row spacings the switchgrass averaged 0.79 t/ac compared to .83 t/ac for the big bluestem. When sampled in areas without gamagrass the switchgrass yields were 1.40 t/ac compared to 1.32 t/ac for the big bluestem.

A reduced amount of perennial weeds (asters (*Aster* spp.), goldenrod (*Solidago* spp.) and milkweed (*Asclepias* spp.) were observed in the mixed stands compared to the gamagrass monoculture (Fig. 4) at both gamagrass row spacings (no data presented).

The unreplicated forage quality sample was taken in 2005 for each of the species to get an indication of the effect that stage of maturity at the time of harvest has on forage quality. Eastern gamagrass was at the early inflorescence stage and big bluestem and switchgrass were still at the vegetative stage. There was very little difference in forage quality between the species (Table 3), indicating the forage could be harvested at this stage without big bluestem and switchgrass negatively impacting forage quality.



Fig. 2 Eastern gamagrass and big bluestem, 6/20/06

Table 1. Biomass of first cutting of eastern gamagrass at 15 and 30 inch row spacings with and without switchgrass and big bluestem in 2005¹

Species or mixture ²	Gamagrass row spacing (in.)	Species	Tons/ac ³
Gamagrass	15	Gamagrass	1.33 abc
Gamagrass	30	Gamagrass	0.89 bc
Gamagrass/Switchgrass	15	Gamagrass	0.79 c
Gamagrass/Switchgrass	30	Gamagrass	0.50 c
Gamagrass/Big bluestem	15	Gamagrass	0.57 c
Gamagrass/Big bluestem	30	Gamagrass	0.59 c
Switchgrass/Gamagrass	15	Switchgrass	1.77 a
Switchgrass/Gamagrass	30	Switchgrass	1.69 ab
Big bluestem/Gamagrass	15	Big bluestem	0.99 abc
Big bluestem/Gamagrass	30	Big bluestem	0.93 bc
LSD ₀₅			0.85

¹ Biomass for one cutting conducted on 6/23/05

² The order of the species indicates which species is being measured for biomass

³ Values with different letters are significantly different by LSD Test at 0.05 level of probability

Table 2. Biomass of first cutting of eastern gamagrass, at 15 and 30 inch row spacings with and without switchgrass and big bluestem in 2006¹

Species or mixture ²	Gamagrass row spacing (in.)	Species	Tons/ac ³
Gamagrass	15	Gamagrass	1.18 ab
Gamagrass	30	Gamagrass	1.28 a
Gamagrass/Switchgrass	15	Gamagrass	0.76 cd
Gamagrass/Switchgrass	30	Gamagrass	0.50 d
Gamagrass/Big bluestem	15	Gamagrass	0.73 cd
Gamagrass/Big bluestem	30	Gamagrass	0.77 cd
Switchgrass/Gamagrass	15	Switchgrass	0.91 bc
Switchgrass/Gamagrass	30	Switchgrass	0.66 cd
Big bluestem/Gamagrass	15	Big bluestem	0.89 c
Big bluestem/Gamagrass	30	Big bluestem	0.76 cd
LSD ₀₅			0.27

¹ Biomass for one cutting conducted on 6/20/06

² The order of the species indicates which species is being measured for biomass

³ Values with different letters are significantly different by LSD Test at 0.05 level of probability

Table 3. Forage quality¹ of eastern gamagrass, switchgrass, and big bluestem harvested on 6/23/05

	%C P	%ADF	%NDF	%Lig.	%DM IVTD	%NDF IVTD
Gamagrass	13.2	36.7	69.4	4.8	78	70
Switchgrass	13.3	33.7	63.8	3.5	82	71
Big bluestem	14.5	35.5	67.2	6.1	79	69

¹ % crude protein (CP), % acid detergent fiber (ADF), % neutral detergent fiber (NDF), % Lignin (Lig.), % *in vitro* total digestibility (IVTD both dry matter (DM) and NDF).



Fig. 3 Eastern gamagrass monoculture, 6/26/06



Fig. 4 Eastern gamagrass control with some weed encroachment, 6/20/06

Weather Information

The average monthly precipitation for the region in 2005 for the months March through June was 4.25 inches below the normal of 15.6 inches. The average monthly temperature for the region in May was 50.8 °F which was 5.0 °F below average. In June the average monthly temperature was 67.7 °F which was 3.4 °F above average. In 2006 the weather was very close to average for the above months.

Conclusions

•The yield of eastern gamagrass grown in 15 vs. 30 inch rows were the same in 2006 due to an increase in the yield of the 30 inch row in 2006

•Eastern gamagrass yields are reduced to about 55% of its monoculture yield when grown in combination with either switchgrass or big bluestem.

•Overall biomass yields were increased by about 74% in 2005 and 17% in 2006 for the mixtures over the eastern gamagrass monoculture. The reduction in 2006 was due to a decrease in the switchgrass biomass.