Technical Note

East Texas Plant Materials Center
Plant Materials Program - Texas May 2006

Nitrogen Use 'Jackson' eastern gamagrass

Background

Eastern gamagrass [Tripsacum dactyloides (L.) L.] is a warm season native perennial with the potential for livestock forage in the southeastern United States. (Dewald, 1991) From 1992 to 1994, the USDA-NRCS East Texas Plant Materials Center and Stephen F. Austin State University Agriculture Department conducted a three year study to evaluate management practices for sustainable production of eastern gamagrass selections in eastern Texas and western Louisiana. 'Jackson' was included in this study. Clipping frequencies of 30, 45, and 60 days and actual nitrogen (N) fertilization rates of 0, 125, 250, and 500 lb / acre were compared on an Attoyac fine sandy loam.

The purpose of this technical note is to provide information about N use efficiency values for 'Jackson' eastern gamagrass as affected by N rate and 45 and 60 day clipping frequencies.

Nitrogen Removal

Nitrogen removal was calculated using the harvested aboveground biomass. There was not a significant difference in N removal between the 45 and 60 day clipping frequencies. In contrast, N removal did increase as N application rates increased within the clipping frequencies. (See Tables 1 and 2) By applying higher N rates, the plant has more potential N to use for growth. Nitrogen removal values varied yearly because of differing soil and weather conditions.

Nitrogen removal did not greatly increase between the 250 lb N / acre rate and the 500 lb N / acre rate. Nitrogen removal did not continue upward in a linear fashion as N application rates increased. Both the 45 and 60 day clipping frequencies reached a level of maximum N removal. (See Figure 1 at the end of this technical note.)

Nitrogen Fertilizer Recovery

Nitrogen fertilizer recovery is an estimate of the efficiency of the plant to remove N from the soil and is expressed as a percentage. Recovery of N is dependent upon factors such as rate and time of application, nitrogen source, species, and moisture. Generally, N recovery by warm season grasses is highest at rates of 180 to 270 lbs. of N / acre. Beyond these amounts less N is used by the plant and more is lost through leaching and volatilization. (Bredja, 2000)

Tables 1 and 2 show the average recovery percentages for the 45 and 60 day clipping frequencies. The 60 day clipping frequency N fertilizer recovery percentages exhibited more variation than the 45 day clipping frequency. (See Figure 2 at the end of this technical note.) In both clipping frequencies, 'Jackson' was most efficient at the 250 lb N / acre rate. Recovery percentages decreased for the 500 lb N / acre rate.

Yield Efficiency

Yield efficiency is defined as the average yield increase per unit of applied N. (Brock, 1984) Tables 1 and 2 show the three year average yield efficiency for the 45 and 60 day clipping frequencies and N rate / acre. Yield efficiency decreased when N application rates reached 500 lb N / acre. This decrease is a normal response by warm season grasses to high nitrogen rates. The yield efficiency of the 60 day clipping frequency declined in a linear fashion whereas the 45 day resembled a curve. (See Figure 3 at the end of this technical note.) Fertilizer response varied on a yearly basis during the study.

Table 1. N use efficiency values for 'Jackson' eastern gamagrass [Tripsacum dactyloides (L.) L.] as affected by N rate and a 45 day clipping frequency, USDA-NRCS East Texas Plant Materials Center, Nacogdoches, Texas 1992-1994.

N Rate	Dry Matter Yield	N [1/] Removal	N Content	N [2/] Recovery	Yield [3/] Efficiency
----------lb /acre----------			----------%----------		---lb DM yield/lb N---
0	7,149	76	1.06	----------	----------
125	11,631	147	1.26	55.9	36
250	16,679	243	1.46	66.1	38
500	16,466	266	1.62	37.5	19

1/ - N removal = (Dry matter yield) x (% N content) / 100

2/ - % N recovery = (N removal of fertilized plot) – (N removal of control plot) / N rate

3/ - Yield efficiency = [forage yield (fertilize) – forage yield (control)] / N fertilizer applied

Table 2. N use efficiency values for 'Jackson' eastern gamagrass [Tripsacum dactyloides (L.) L.] as affected by N rate and a 60 day clipping frequency, USDA-NRCS East Texas Plant Materials Center, Nacogdoches, Texas 1992-1994.

N Rate	Dry Matter Yield	N [1/] Removal	N Content	N [2/] Recovery	Yield [3/] Efficiency
----------lb/acre----------			----------%---------- ---		--lb DM yield/lb N---
0	10,011	88	.88	----------	----------
125	17,320	173	1.0	63.9	58
250	21,905	271	1.24	70.4	48
500	18,023	252	1.40	30.8	16

1/ - N removal = (Dry matter yield) x (%N content) / 100

2/ - % N recovery = (N removal of fertilized plot) – (N removal of control plot) / N rate

3/ - Yield efficiency = [forage yield (fertilize) – forage yield (control)] / N fertilizer applied

Application

- Since 'Jackson' eastern gamagrass removes N from the soil, this cultivar could be considered when addressing water quality concerns and phytoremediation of high levels of soil N. (NRCS Practice Standards Nutrient Management – 590 and Filter Strips – 393.)
- This information would be applicable when using 'Jackson' eastern gamagrass for forage production. (NRCS Practice Standards Prescribed Grazing – 528 and Forage Harvest Management – 511.)

References:

Bredja, J.J. 2000. Native Warm Season Grasses: Research Trends and Issues. CSSA Special Publication No. 30.

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Brock, B.R. 1984. Efficient use of nitrogen in cropping systems. P.273-293. *In* R.D. Hauck (ed.) Nitrogen in Crop Production. ASA, CSSA, SSSA, Madison, WI.

Dewald, C., J. Henry, S. Bruckerhoff, J. Ritchie, D. Shepard, S. Dabney, J. Douglas, and D. Wolfe. 1996. Guidelines for the establishment of warm season grass hedge for erosion control. J. Soil and Water Conserv. 51 (1): 16-20.

Dewald, C.L. 1991. Eastern gamagrass Introductory Information. Southern Plains Range Research Station, USDA-ARS.

Douglas, J. 1993. Effects of Clipping Frequency and N Rate on Yield and Quality of Eastern gamagrass. Master's Thesis.

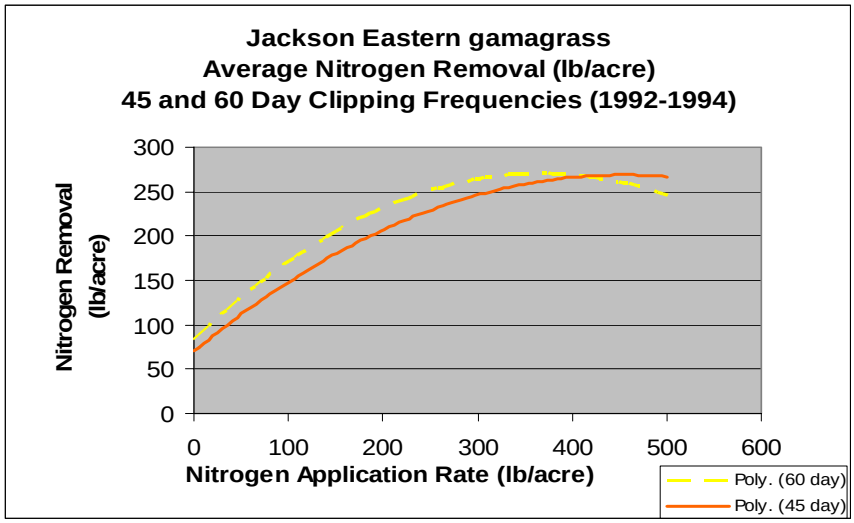

Figure 1 – N removal of 'Jackson'

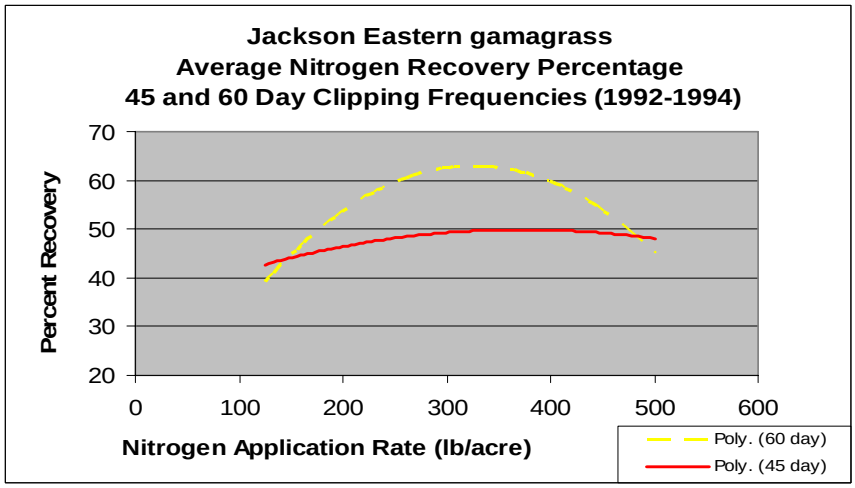

Figure 2 – N recovery percentage of 'Jackson'

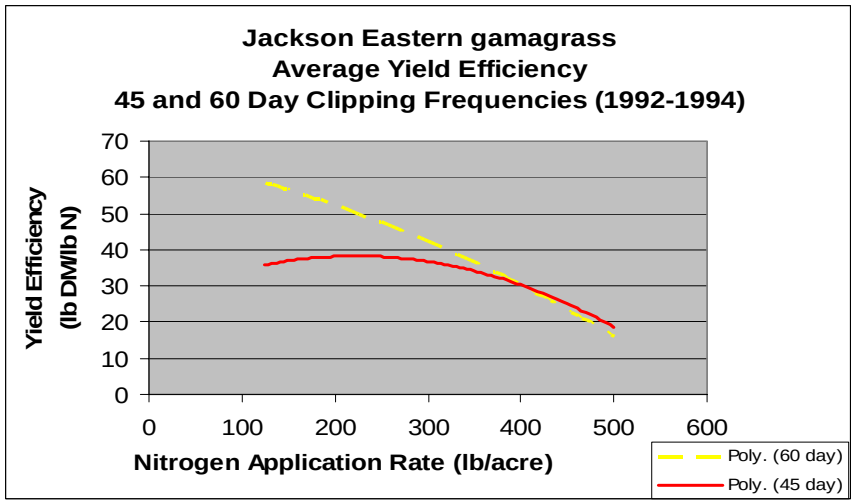

Figure 3 – Yield efficiency of 'Jackson'