Bermudagrass Hay Yield Response to Different Fertilizer Sources

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RESEARCH & EXTENSION
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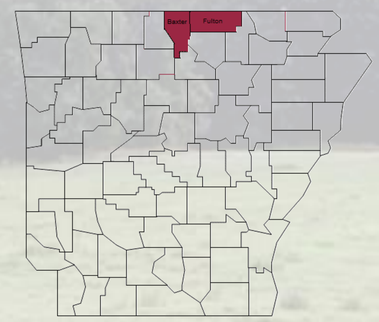


OBJECTIVES & HYPOTHESES

Need for Research:

- Forage producers are faced with making economical fertilizer decisions from a variety of sources.
- Liquid fertilizer stand alone or supplement products are marketed and readily available.
- Forage producers oftentimes search out for the newest product to increase yield at a lower input cost.
- Fertilizer application practices in northern Arkansas generally follow historical trends, such as standard rates of 17-17-17 or poultry litter without regard to soil nutrient analysis or hay nutrient removal rates.
- Producers don't believe that there is a good return on investment by fertilizing up to soil test recommendations.
- Bermudagrass nutrient removal per ton dry matter is 42 lbs. N, 14 lbs. P_2O_5, 48 lbs. K_2O, and 4.5 lb. S

Hypotheses:

- The soil test recommended fertilizer application with commercial fertilizer will yield higher forage DM than the other treatments.
- The liquid fertilizer application will not yield a significant difference in forage DM compared to the control.
- Supplementing commercial fertilizer or poultry litter treatments with liquid fertilizer will not increase yields when compared to the fertilizer/litter treatments alone.
- Utilizing ammonium sulfate as a nitrogen source will increase yields when soil test SO_4-S is <12 ppm.
- Cost per ton forage dry matter (DM) will be lower when fertilizing to soil test recommendations as compared to other treatments.

RESULTS & DISCUSSION

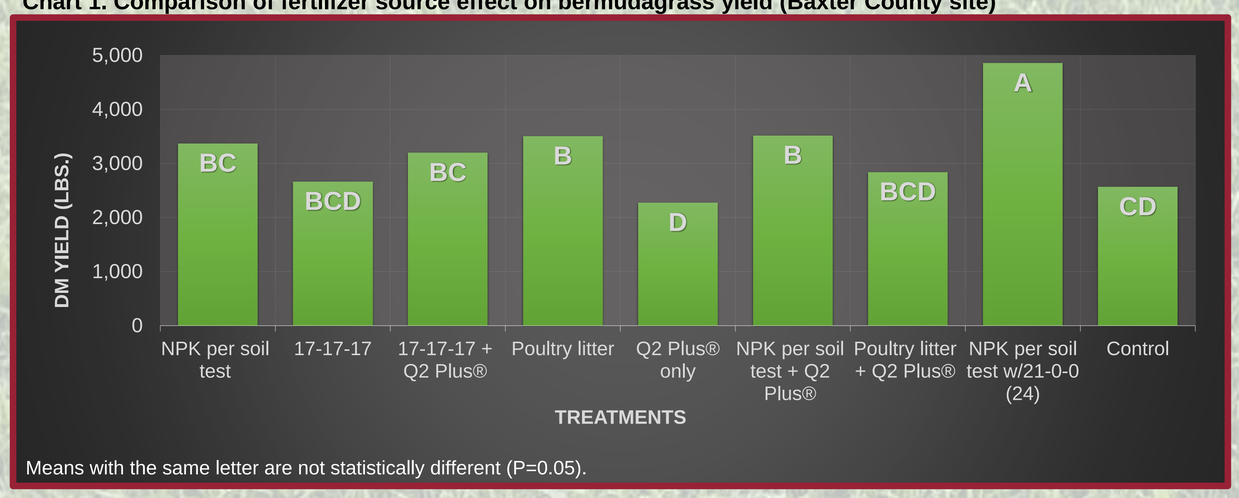
The statistical differences between treatments varied by location. At the Baxter County site, yields did not differ between the soil test recommended fertilizer application without sulfur, 17-17-17 at 250 lbs./acre, or poultry litter at 2 tons/acre. Yields also did not differ between the commercial fertilizer without sulfur application or the 17-17-17 application and the control. At the Fulton County site, yields differences were similar. Yields with commercial fertilizer without sulfur and 17-17-17 at 250 lbs./acre did not differ. Both were higher than that of poultry litter alone. Yields also did not differ between the 17-17-17 or the poultry litter application and the control.

At both sites, yields did not differ in those plots that were treated with Q2 Plus® only and those that did not receive any treatment (control). In both locations, when Q2 Plus® was coupled with a treatment, such as 17-17-17, poultry litter, or commercial fertilizer at soil test recommended rates, the forage yields did not differ from the standalone treatments with Q2 Plus®.

Concerning sulfur, University of Arkansas soil tests recommend a sulfur application of 20 lbs. of sulfate (SO_4-) (100 lbs./acre of ammonium sulfate fertilizer) if the soil test level is below 12 ppm. The soil test sulfur levels for the Baxter and Fulton County sites were 9 and 13 ppm, respectively; therefore a sulfur application was warranted for the Baxter County site only. The Baxter County plots that received ammonium sulfate as a part of their nitrogen need yielded an average of 4,854 lbs. dry matter per acre. Those that received the same level of N, P, and K without the sulfur yielded 3,369 lbs. /acre. The addition of ammonium sulfate cost $5.91 more per acre in application cost compared to the plots using ammonium nitrate only as a N source (Table 2). However, because of the increased yields, it resulted in a dry matter cost per ton that was $21.44 less than the application without sulfur (Chart 3). In the Fulton County trial, where sulfur levels were at 13 ppm and therefore above the threshold for a sulfur application, there was no difference (P=0.05) in yields between the N, P, and K application that contained ammonium sulfate and the one that did not. It should be noted that the difference between 9 ppm and 13 ppm is approximately 8 lbs./acre, nearly the removal rate for 2 tons of bermudagrass hay.

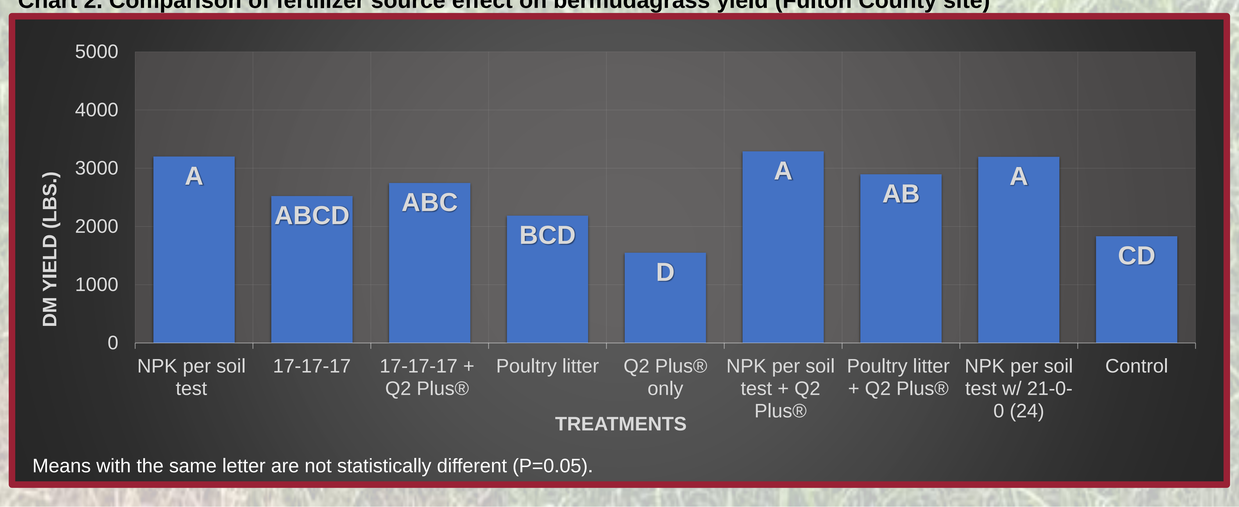
Costs per ton of forage dry matter (Chart 3) were higher when fertilizing to soil test recommendations as compared to the other treatments at either site, yet yields did not significantly differ with minor exception, possibly indicating a need for further research of bermudagrass yield response and the associated soil test recommendations.

Chart 1. Comparison of fertilizer source effect on bermudagrass yield (Baxter County site)



Means with the same letter are not statistically different (P=0.05).

Chart 2. Comparison of fertilizer source effect on bermudagrass yield (Fulton County site)



Means with the same letter are not statistically different (P=0.05).

MATERIALS AND METHODS

The research was conducted at two bermudagrass hay field sites, located in Baxter and Fulton Counties, with 9 treatments, replicated 4 times for each site. Soil testing was done the previous winter at a sampling depth of 4".

Individual plots measured 10' x 22' (1/2% acre). Buffer boundaries of 2' were left between individual plots and sprayed with glyphosate. Dry fertilizer and litter applications were made by hand following the first cutting on May 27, 2019. Q2 Plus® liquid fertilizer was applied with a calibrated backpack sprayer. Treatments on soil test recommended plots were site specific and differed (Tables 1,2). The nitrogen and potassium sources were ammonium nitrate (34-0-0), potash (0-0-60), respectively. Ammonium sulfate (21-0-0(24)) was used as a sulfur source in treatment 8 and to satisfy 21 lbs. of the N requirement. Nutrient analysis of the poultry litter indicated a nutrient content as-is basis of 33.2 lbs. N/ton, 39.5 lbs. P_2O_5/ton, and 29.2 lbs. K_2O/ton. Rates and associated costs can be found in Table 2.

Plots were harvested 43 days after treatment, with a self-propelled sickle mower by cutting a 3.25' strip from the plot centerline at a height of 3". Subsamples were dried for 48 hours to determine forage moisture content. Dry matter yields were then calculated on a per acre basis.

Data was analyzed as a randomized complete block design with four replications using the Proc GLM procedure in SAS. Mean separation was accomplished by determining the least significant difference (LSD) among treatments. Data was analyzed separately for each location.

Table 1. Soil test results & fertilizer* recommended for warm-season grass hay production (2 tons/acre)

Location	pH	P (ppm)	K (ppm)	$S0_4$ (ppm)	Fertilizer Recommendation
Baxter	6.2	174	27	9	100-0-200
Fulton	5.8	41	93	13	100-0-120

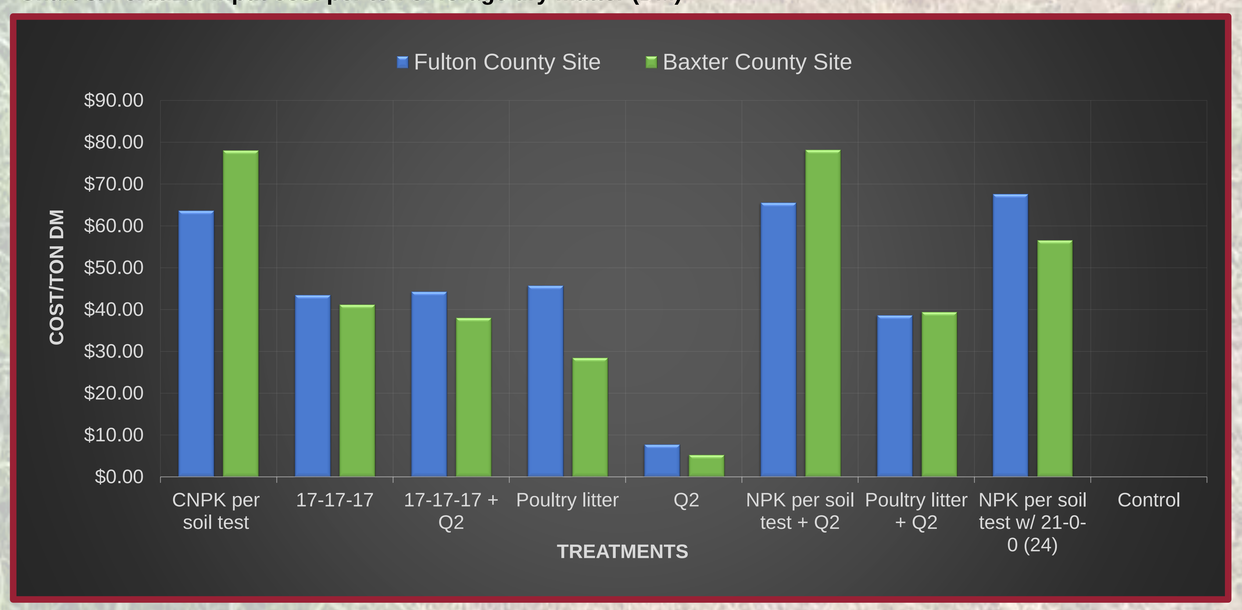
* University of Arkansas crop code 132

Table 2. Fertilizer treatment, rates, and cost per acre

Trt #	Treatment	N-P_2O_5-K_2O lbs. /Acre	Average Cost/Acre
1	NPK per soil test [34-0-0 and 0-0-60]	100-0-200 (*Baxter County site*) 100-0-120 (*Fulton County site*)	$116.63
2	17-17-17 @ 250 lbs./acre	42-42-42	$54.88
3	17-17-17 + Q2 Plus® @ 250 lbs./acre + 8 fl. oz./acre	42-42-42 + undetermined*	$60.88
4	Poultry litter @ 2 tons/acre	66-79-58	$50.00
5	Q2 Plus® only @ 8 fl. oz./acre	undetermined*	$6.00
6	NPK per soil test + Q2 Plus® [34-0-0 and 0-0-60 + 8 fl. oz./acre]	100-0-200 + undetermined* 100-0-120 + undetermined*	$122.63
7	Poultry litter + Q2 Plus® @ 2 tons/acre + 8 fl. oz./acre	2 tons + 8 fl. oz.	$56.00
8	NPK per soil test w/ added sulfur [34-0-0, 0-0-60, and 21-0-0 (24)]	100-0-200 + 24 lbs. SO_4 (*Baxter County site*) 100-0-120 + 24 lbs. SO_4 (*Fulton County site*)	$122.69
9	Control	n/a	$0.00

*The nutrient content of Q2 Plus® was unable to be determined from the product container.

Chart 3. Fertilizer input cost per ton of forage dry matter (DM)



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