Agriculture and Natural Resources

GRAIN SORGHUM YIELD RESPONSE TO RESIDUAL NITROGEN AND PHOSPHORUS IN NUECES COUNTY

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Summary

This test was located on the Darrel Lawhon Farm, North of Concordia, CR 73B. Soil conditions at planting were fair. There was not a statistical difference between the treatments in which no additional nitrogen (N) or phosphorus (P) were applied as compared to treatments were additional units were applied.

Objective

To determine yield response of grain sorghum to residual nitrogen found in the soil profile and also evaluate yield response to different phosphorus rates.

Materials and Methods

Soil samples were taken down to a depth of 4 feet on February 23, 2011. Soil test recommendations were based on a 5,000 pound per acre crop yield goal. According to soil tests, cumulative residual NO_3-N to a depth of 48 inches was 101 lb/acre. Amounts of residual NO_3-N present in increments of soil depth were: 0-6 inches (7 lb/A); 6-12 inches (10 lb/A); 12-24 inches (16 lb/A); 24-36 inches (40 lb/A); 36-48 inches (28 lb/A). Rates of N applied (treatments) were then based on credit toward the amount of residual NO_3-N in increments of soil depth. Fertilizer applications were made in a band application to a depth of 4-6 inches on March 24, 2011. Five randomized complete blocks were established with the following treatments:

1. No additional N; soil test P_2O_5 recommended is 50 lb/A
2. 67 lb N/A and 50 lb P_2O_5/A
3. 83 lb N/A and 50 lb P_2O_5/A
4. 100 lb N/A and 50 lb P_2O_5/A
5. N based on yield goal: 100 lb/A and 50 lb P_2O_5/A + AVAIL (0.5% v/v)
6. N based on yield goal: 100 lb/A and 25 lb P_2O_5/A
7. N based on yield goal: 100 lb/A and 0 lb P_2O_5/A

Grain sorghum was planted in 19-inch rows on March1, 2011. Sorghum plant stand counts were taken on June 27, 2011 with average plant population being 51,000 plants per acre.

Rainfall during the growing season was below normal totaling 2.77 inches and occurred as follows; March=0.31 April = 0 inches, May= 1.75 inches, June=0.71 inches.

Ten feet from each of four yield rows per plot were hand harvested on June 23, 2011.

Results and Discussion

In Table 1, one can see that there was not a statistical difference between any of the five N treatments, meaning that the control (0-50-0), was the cheapest and best option under these field conditions.

Table 1. Comparison of test weight, yield, and treatment cost as it relates to fertilizer nitrogen treatments applied on Darrell Lawhon Farm, Nueces County, Texas, 2011.

Treatment	Sorghum Test Wt. (lb/bu)	Sorghum Yield† (lb/A)	Treatment Cost ($/A)
1. 0-50-0	53.1	4,578	45.94
2. 67-50-0	52.7	4,101	78.52
3. 83-50-0	53.8	4,723	88.52
4. 100-50-0	52.7	4,376	99.14
Pr>F	0.6335	0.4594	
$LSD_{0.05}$	ns	ns	
CV	2.36	12.05	
Grand Mean	53.1	4,440	

†Yields corrected to 14% moisture.

As with the N treatments, there was no statistical difference between P treatments (Table 2). Thus, additional P applied alone or in combination with AVAIL was not needed by the crop. According to soil test results, most of the available phosphorus from 0 to 48 inches was present in the top 12 inches.

Table 2. Comparison of test weight, yield, and treatment cost as it relates to fertilizer phosphorus treatments applied on Darrell Lawhon Farm, Nueces County, Texas, 2011.

Treatment	Sorghum TestWt. (lb/bu)	Sorghum Yield† (lb/A)	Treatment Cost ($/A)
4. 100-50-0	52.7	4,376	99.14
5. 100-50-0 + AVAIL	53.5	4,478	~104.14
6. 100-25-0	53.0	4,427	80.83
7. 100-0-0	53.6	4,567	62.50
Pr>F	0.4401	0.9670	
$LSD_{0.05}$	ns	ns	
CV	1.74	14.03	
Grand Mean	53.2	4,462	

†Yields corrected to 14% moisture.

Conclusions

In this study, grain sorghum did an excellent job at using residual N and P in the soil profile that was carried over from the previous cropping season. As seen in the results, there was not a statistical difference between treatments in which no additional N or P was applied as compared to treatments where additional units were applied. With mean grain sorghum yield at 500 pounds less than the yield goal target, very dry growing conditions likely impacted the response of grain sorghum to fertilizer application in this study.

It is important to note, that soil test recommendations for fertilizer are made assuming a broadcast application. If the nutrients are applied in a subsurface band, P rates could be reduced up to 50%.

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