SOD SEEDED GRAIN SORGHUM AND CORN YIELD RESPONSE TO ANHYDROUS AMMONIA

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Introduction

Nitrogen is the largest and most expensive fertilizer component used in growing corn (Zea mays L.) and sorghum (Sorghum bicolor L. Moench) in the United States. Anhydrous ammonia is one of the least expensive sources of available N for agronomic crops.

Materials and Methods

Two separate experiments at two locations were planted during 1983. The experiments were in randomized complete block designs with six replications, one testing 'Pioneer brand X304C' a tropical corn hybrid and the other utilizing 'DeKalb DK59' grain sorghum planted into 15 year old bahiagrass (Paspalum notatum L. Flugge cv. 'Pennsicola') sods. One location was planted on June 9, 1983 on a Kershaw fine sand (thermic, uncoated Typic Quartzipsamment) an excessively drained sand and the other on June 23, 1983 on a Chiefland fine sand (Loamy, siliceous, thermic, Arenic Hapludalf).

'The plats were 8 rows, 30 inches wide, and 40 feet in length. The plots were planted with an in-row subsoil planter with anhydrous tube attached to the subsoil shank. The corn was planted at a population of 22,500 plants/acre and the sorghun at 65,000 plants/acre. No irrigation was provided at either location. An application of 1.5 lb. active ingredient (a.i.) Carbofuran 15G (Furadan) was applied in front of the press wheel at planting. Ten days prior *to* planting, an application of 0.75 lb a.i glyphosate (Roundup) plus 2.0 quarts of X-77 surfactant/100 gallons of water was applied in a spray volume of 17 gallons/A. at 40 p.s.i. This was done to suppress the bahiagrass sod prior to planting.

All plots were fertilized with a broadcast application of 120 lb K_2O/A, 16.5 lb S/A, and 8.25 lb Mg/A just prior to planting. Sources of K, S, and Mg were K_2SO_4, $MgSO_4$ (K-Mag), and KCL (Muriate of Potash). Nitrogen was applied at planting under the row and injected from the subsoil shank at a 10 inch depth. Nitrogen rates were randomized and applied at 0, 50, 100, 150 and 200 lb N/A.

On July 26 and 27 at the two locations, .25 lb a.i. paraquat plus 1 pint X-77/100 gallons was direct sprayed to further suppress the sod. Plots at location one were hand harvested on September 12, 1983 and those at location two on September 26, 1983.

Results and Discussion

The corn showed a grain arid stover yield response to the 100 Ib N/A rate averaged over the two locations. One location responded to 50 lb N/A for grain residue, and whole plant dry matter yields due to insufficient rainfall during the silking to ear fill period. Grain yield significantly decreased with increasing rate of N at one location where rainfall was limiting. This physiological response of corn to drought stress has been reported previously.

Differences occurred at the 150 1b N/A rate averaged over the two locations for corn stalk dry matter, whole plant dry matter, and corn residue dry matter yields. The corn grain to residue ratio averaged over the two locations was significant at the 50 lb N/A rate.

Grain sorghum yields differed at each location and responded similarly to increasing rate of N from 0 to 200 lb N/A. Percentage of grain was significant only in the plots receiving no supplemental N. A significant interaction occurred due to location for number of plants in the final stand and tne grain to residue ratio.

In summary, the rate of anhydrous ammonia as applied in this experiment, had an effect on most components measured. Insufficient rainfall at one location and distribution of rainfall had a greater effect on corn yields than on sorghum yields.

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Table 1. Corn response to no-tillage in-row subsoil planting into bahiagrass sod as influenced by rates of anhydrous ammonia and location.

N Treatment	Location: Miller farm	Location: Stevens farm	Average
1b. N/acre	Grain yield bu./A		
0	4 c	7 c	6 c
50	22 a	28 b	25 b
100	20 ab	51 a	35 a
150	21 ab	61 a	41 a
200	13 b	67 a	40 a
	Stalks Ton DM/A		
0	0.69 b	0.60 c	0.64 c
50	1.17 a	1.59 b	1.38 b
100	1.21 a	1.76 b	1.48 b
150	1.39 a	2.30 a	1.84 a
200	1.17 a	2.31 a	1.74 a
	Corn residue Ton DM/A		
0	0.70 b	0.61 c	0.65 c
50	1.31 a	1.62 b	1.46 b
100	1.33 a	1.90 b	1.61 b
150	1.52 a	2.39 a	1.95 a
200	1.28 a	2.46 a	1.87 a
	Whole plant Ton DM/A		
0	0.81 b	0.68 d	0.74 d
50	1.84 a	2.29 c	2.06 c
100	1.82 a	3.12 b	2.47 b
150	2.02 a	3.84 ab	2.93 a
200	1.59 a	4.07 a	2.83 a
	Grain/Residue		
0	0.14 c	0.16 c	0.15 b
50	0.41 a	0.42 b	0.42 a
100	0.35 ab	0.63 a	0.49 a
150	0.33 ab	0.62 a	0.48 a
200	0.25 bc	0.65 a	0.45 a

Values in columns within a variable not followed by the same letter are significantly different at the 0.05 level of probability according to **Duncan's** new multiple range test.

Table 2. Grain sorghum response to no-tillage in-row subsoil planting into bahiagrass sod as influenced by rates of anhydrous ammonia and location.

N Treatment	Location		
	Miller farm	Stevens farm	Average
lb. N/acre	Grain yield bu./A		
0	9 c	4 c	7 c
50	35 b	14 b	25 b
100	34 b	16 b	25 b
150	40 ab	27 a	38 a
200	46 a	25 a	34 a
	Whole plant Ton DM/A		
0	0.93 c	1.02 c	0.98 a
50	2.17 b	2.42 b	2.29 c
100	2.45 ab	3.12 a	2.79 b
150	2.69 ab	3.23 a	2.96 b
200	3.02 a	3.48 a	3.25 a
	Residue Ton DM/A		
0	0.70 d	0.93 c	0.84 d
50	1.31 c	2.07 b	1.65 c
100	1.62 b	2.72 a	1.97 b
150	1.71 ab	2.57 ab	2.07 b
200	1.91 a	2.86 a	2.40 a
	Grain/Residue		
0	0.31 b	0.11 b	0.20 c
50	0.64 a	0.17 ab	0.44 a
100	0.51 a	0.16 ab	0.32 b
150	0.58 a	0.25 a	0.40 a
200	0.60 a	0.21 a	0.40 a

Values in columns within a variable not followed by the same letter are significantly different at the 0.05 level of probability according to Duncan's new multiple range test.