

SOIL/WATER RESEARCH

South Dakota State University

2008 Progress Report

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Starter fertilizer rate, type, and precision placement influence on final corn plant stand and grain yield near Brookings SD in 2008. (42708)

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Introduction

Seed placed fertilizers are very popular because of easy application which reduces the need for additional fertilizer coulters. However, there are limits to the rate of seed placed fertilizers due to

seed injury issues. Seed injury is affected by many factors including crop planted, fertilizer type, rate and soil moisture at planting time. Developing technology can apply liquid fertilizers between the seeds in the planting furrow. In theory, this placement should cause less injury than a continuous fertilizer stream. This technology needs to be tested for reliability and agronomic effectiveness. Therefore, a research project was initiated to evaluate the effect of precision fertilizer placement (mid-seed) on final plant population and grain yield.

Materials and Methods

Item	Description
Location	Felt farm near Brookings, SD
Soil Type	Brookings, silty clay loam
Tillage method	conventional
Fertilizer materials	10-34-0, ATS (ammonium thio-sulfate) and custom blend (11-14-0-14S-0.7Zn)
Fertilizer application rates	10-34-0 and custom blend = 0 and 5 gpa, ATS = 10 gpa
Fertilizer placement	with seed (continuous) and between seeds (mid-seed)
Hybrid, seeding rate and date	DKC 46-60 (30,100 seeds/a) May 20
Soil Tests	0-6 inch (P, K, Zn,) and 0-24 inch (S)
plot size	10 x 40 ft
harvest date	Nov. 4
Statistics (SAS)	RCBD split plot (fertilizer material - main, placement -sub) 4 reps

Results and Discussion

Statistics were computed using two separate ANOVA evaluations with SAS.

ANOVA one evaluated the effect of fertilizer material (10-34-0 and custom blend), rate (0 and 5 gpa), and placement (continuous and mid-seed) on final plant population and grain yield (Table 1 or 3). No single or interaction source of variation (SOV) significantly influenced grain yield and only fertilizer source significantly influenced final plant population. Final plant populations were significantly lower with the custom fertilizer blend when compared with 10-

34-0 (Table 1 or 3). This difference cannot be explained since application rate was non-significant and there was no significant interaction.

ANOVA two evaluated the rate (0 and 10 gpa) and placement (continuous and mid-seed) of ammonium thio-sulfate (ATS) (Table 2 or 3). The ATS treatment was used at a high rate because it is highly toxic to seed germination. Therefore, differences in placement relative to the seed should be apparent. No single or interaction SOV significantly influenced grain yield and only rate influenced final plant population. Despite ATS placement (continuous or mid-seed) the

application of ATS significantly reduced final plant population by 3863 plants per acre when compared to the check plots. There was a trend for increased stand (plants/a) with mid-seed placement of ATS ($Pr > F = 0.13$) over continuous placement.

In summary corn grain yields were not influenced by 10-34-0 or a custom blend. Soil tests (0-6 inch) were Olsen P (10 ppm), extractable K (118 ppm), and Zn (0.59 ppm).

There was 31 lbs S/a (0-24 inch). ATS placed with the seed at 10 gpa did decrease plant populations with a resulting trend for lower yields. Placing the ATS between the seeds resulted in a trend of higher plant populations when compared to a continuous stream.

Acknowledgments

This project partially supported by the SD Ag. Experiment Station and the Soil Testing Lab.

Table 1. Starter Fertilizer source, rate and placement influence on final plant population, and grain yield near Brookings SD in 2008. (42708)

Source of Variation	Final Plant Population	Grain Yield
	----- Pr > F -----	
Fertilizer Source (S) ^A	0.04	0.79
Fertilizer Rate (R) ^B	0.30	0.31
Fertilizer Placement (P) ^C	0.85	0.59
S x R	0.75	0.57
S x P	0.31	0.23
R x P	0.77	0.93
S x R x P	0.37	0.80
Means:	plants/a	---- bu/a ----
Fertilizer Source^A		
Custom Blend	30113	175.6
10-34-0	31363	173.1
LSD _(.10)	831	NS
Fertilizer Rate^B		
0 gpa	30966	170.5
5 gpa	30511	178.2
LSD _(.10)	NS	NS
Fertilizer Placement^C		
Continuous	30795	176.6
Mid-Seed	30682	172.1
LSD _(.10)	NS	NS

^A custom blend = 11-14-0-14S-.7Zn or 10-34-0

^B gallons per acre

^C continous = applied length of row, mid-seed = between seeds

Table 2. Ammonium Thio-Sulfate (ATS) rate and placement influence on final plant population and grain yield near Brookings SD in 2008. (42708)

Source of Variation	Final Plant Population	Grain Yield
	----- Pr > F -----	
Fertilizer Rate (R) ^A	0.01	0.39
Fertilizer Placement (P) ^B	0.13	0.29
R x P	0.42	0.81
Means:	plants/a	---- bu/a -----
Fertilizer Rate ^A		
0 gpa ^C	31477	170.8
10 gpa	27614	162.5
LSD _(.10)	1415	NS
Fertilizer Placement ^B		
Continuous	28750	164.0
Mid-Seed	30341	169.4
LSD _(.10)	NS	NS

^A gallons per acre

^B continuous = applied length of row, mid-seed = between seeds

^C check plots for 10-34-0 used.

Table 3. Influence of fertilizer material and placement on grain yield and plant population near Brookings SD in 2008 (42708).

Fertilizer Material	Rate gpa ^A	Grain Yield Placement ^B		Plant Population Placement ^B	
		Continuous ----- bu/a -----	Mid-Seed -----	Continuous ----- plants / a -----	Mid-Seed -----
10-34-0	0	168.5	173.2	30909	32045
	5	171.7	179.1	31136	31364
Custom Blend ^C	0	176.4	163.8	31364	29545
	5	189.9	172.2	29773	29773
ATS	10	159.4	165.5	26591	28636

^A gallons per acre

^B continuous = applied length of row, mid-seed = between seeds

^C custom blend = 11-14-0-14S-0.7Zn