

Soybean Response to Rate of Broadcast Potassium Fertilization on Four Different Soil Types

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Objective

To determine yield response of soybeans to additional broadcast potassium fertilization on marginal soil test level soils.

Background

Cooperator:	Todd Hesterman	Variety:	Pioneer 93B87
County:	Fulton	Planting Date:	5/7/05
Soil Type:	Mermill loam, Rimer loamy fine sand, Nappenee loam, Hoytville clay loam	Seeding Rate:	180,000 seeds/A
Tillage:	No-till	Row Width:	7.5 inches
Previous Crop:	Corn	Herbicides:	Canopy XL, 4oz.; Boundary 2 Pts; & 2,4-D 16oz. per acre on 4/15/05
Soil Test:	see table below	Harvest Pop:	150,000 plants/A
Fertilizer Rate:	0-0-60 at 0, 90 and 180 lbs K ₂ O per acre	Harvest Date:	September 3, 2005

Methods

Plots were established across 4 different soil types with 3 (0, 90, and 180 pounds of K₂O) rates of potassium fertilizer. SERGO soil data was used to determine soil type break areas. The plots were 60 foot wide and 170-800 foot long per soil type area with 4 replications in a randomized complete block design. Soil samples 8 inches deep were taken prior to fertilizer application on 4/19/05. Fertilizer was spread on 4/21/05 with a 50 foot spreader set to 90 pounds per acre. A double pass was used to obtain the higher rate. The field was planted with a John Deere 750, 15 foot drill. The field was sprayed for soybean aphid with Warrior (2.6 oz/A) and Lorsban (4oz/A) on 7/23/2005. The plots were harvest with a John Deere 9500 equipped with Greenstar system. Data was post-processed with Arcview 3.3 to eliminate plot boarder areas and generate plot averages.

Results

Soil test results in Table 1 showed the Mermill, Rimer and Napanee soil type to be below the crop maintenance range for potassium based on Tri-state Fertilizer Recommendations. The Hoytville soil type was within the crop maintenance range for potassium.

Yield Results shown in Table 2 were significantly different for the Rimer soil type which had the lowest soil test level of potassium. The result of the tissue analysis shown in Tables 3 through 6 for each soil type did not show any differences.

Table 1. Soil Test Results

Soil Type	OM (%)	P (ppm)	K (ppm)	Mg (ppm)	Ca (ppm)	pH	BpH	CEC
Mermill (Mf)	3.1	22	98	190	1500	5.7	6.7	12.9
Rimer (RnA)	2.4	19	71	120	950	6.0	6.9	7.1
Nappanee (NnA)	2.8	10	93	255	1900	7.3		11.9
Hoytville (Ho)	4.5	38	120	210	2000	6.4	6.8	14.5

Table 2. Yield Results

Treatment	ALL				
	Soils	Mf	RnA	NnA	Ho
0	36.1	33.5	35.7	36.2	38.0
90	35.4	33.2	35.0	35.5	37.2
180	36.4	34.2	36.9	36.6	37.4
LSD (0.05)	NS	NS	NS	NS	NS
LSD (0.10)	NS	NS	1.0	NS	NS
CV %	2.7	4.6	2.1	2.6	2.2

Table 3. Effect of potassium application on soybean tissue nutrient content at the on-farm site in Fulton County, Hoytville soil.

Potassium rate, lb/acre	Tissue concentration determined at R1			
	Phosphorus	Potassium	Calcium	Magnesium
	-----mg/kg-----			
0	2943	15377	13050	4080
90	2972	15214	13174	4083
180	2859	14970	13737	4042
LSD (0.10)	NS	NS	NS	NS

Table 4. Effect of potassium application on soybean tissue nutrient concentration at the on-farm site in Fulton County, Mermill soil.

Potassium rate, lb/acre	Tissue concentration determined at R1			
	Phosphorus	Potassium	Calcium	Magnesium
	-----mg/kg-----			
0	3011	14630	12957	4007
90	3467	13955	12306	4141
180	3267	14747	12296	3855
LSD (0.10)	NS	NS	NS	NS

Table 5. Effect of potassium application on soybean tissue nutrient concentration at the on-farm site in Fulton County, Nappanee soil.

Potassium rate, lb/acre	Tissue concentration determined at R1			
	Phosphorus	Potassium	Calcium	Magnesium
	-----mg/kg-----			
0	2724	9964	13597	5163
90	2892	9556	13729	5313
180	2714	10462	13257	5161
LSD (0.10)	NS	NS	NS	NS

Table 6. Effect of potassium application on soybean tissue nutrient concentration at the on-farm site in Fulton County, Rimer soil.

Potassium rate, lb/acre	Tissue concentration determined at R1			
	Phosphorus	Potassium	Calcium	Magnesium
	-----mg/kg-----			
0	3113	15141	12004	3849
90	3127	13886	12839	4256
180	3236	14005	13430	4311
LSD (0.10)	NS	NS	NS	NS

For additional information, contact:

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