

Comparison of a Poultry Litter Fertilizer Program to a Commercial Fertilizer Program – (2003-2006)

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Objectives

This research is designed to compare a fertility program using all commercial chemical fertilizers to a fertility program using poultry litter as a source for phosphorus and potassium, plus commercial fertilizer to supply nitrogen requirements.

Background

Soil Type:	Hoytville clay, Haskins loam	Herbicide:	4 pt/A Guardsman Max +
Drainage:	Tile- nonsystematic	PRE (April 28)	1.5 fl oz/A Balance Pro
Previous Crop:	Wheat	Insecticide:	none applied
Tillage:	fall disk/ripper; spring field cultivate (2x)	Hybrid:	Garst 8523IT (108 day)
Soil Test(2002):	pH 6.2, P 33 ppm, K 137 ppm prior to the start of this trial.	Row Width:	30 inches
Fertilizer:	See Methods	Planting Rate:	31,200 seeds/A
		Planting Date:	April 28, 2006
		Harvest Date:	October 30, 2006

Methods

This study is set up with two treatments replicated four times in a complete randomized block design. One treatment consists of a soil fertility program based solely on the use of commercial fertilizers; the other treatment is a soil fertility program based on a combination of poultry litter and commercial fertilizers. A single application of poultry litter was intended to supply multiple years of phosphorus and potassium in the poultry litter plots. A poultry litter application at a rate of 3.75 ton/acre was made for each poultry litter plot on April 16, 2003. The poultry litter used in this trial contained 77 lbs. P₂O₅, 57 lbs. K₂O, and 31 lbs. total nitrogen per ton based on laboratory analysis. Each plot is 105' wide by 1030' long, for an area of 2.48 acres per plot.

Yearly soil testing is done to monitor phosphorus (P) and potassium (K) levels in both the commercial fertilizer and poultry litter plots. Twenty soil cores were taken from each plot in the fall after harvest. The cores were mixed in a plastic container, and this composite sample was analyzed for pH, potassium, and phosphorus. The non-poultry litter plot's commercial fertilizer consisted of 285 lb/acre of 0-23-30 which was surface broadcast on November 2, 2005. All plot sreceived 95 lb/acre 45-0-0 2x2 banded at planting and 165 lb nitrogen/acre sidedressed as 28% UAN on June 5, 2006.

Harvest populations (October 30) were estimated by counting the number of plants on each side of a 17.5 foot section at three different locations in each plot. The average number of plants counted per 17.5 feet was converted to plants per acre. Yields were collected from 1.5 combine rounds (45 feet width) from the center of each plot harvested with a John Deere 6620 combine equipped with a calibrated AgLeader PF3000 yield monitor. Individual plot wet weights and

moistures were taken from the combine yield monitor. Yields reported in this study are adjusted to 15% moisture.

Results

Table 1. Corn harvest population, moisture, and yield.

Treatment	Harvest Population (plants/A)	Moisture (%)	Yield (bu/A)
Commercial P & K	25,200	18.2	173.8
Poultry Litter	24,600	17.6	169.1
LSD (0.05)	NS	0.1	NS
F-test	1.1	216	<1
CV (%)	3.4	0.3	2.9

NS= not significant

Table 2. Soil test data. Soil samples are taken in the fall after each crop.

Treatment	2002	2003	2004	2005	2006
	----- pH -----				
Commercial P & K	6.4	6.2	6.2	6.4	6.1
Poultry Litter	6.4	6.3	6.5	6.4	6.3
	----- Potassium (ppm) -----				
Commercial P & K	163	167	192	148	157
Poultry Litter	151	180	183	148	143
	----- Phosphorus (ppm) -----				
Commercial P & K	38	44	44	34	40
Poultry Litter	35	48	49	36	39

Summary

Results from this year's study indicate there was no statistical difference between the two treatments with regards to harvest population or yield (Table 1). This data supports results from the past three years that indicate no statistical difference with regards to yield when corn (2003), soybeans (2004), and wheat (2005) were the study crops. The grain moisture difference in 2006 was not expected, and is not consistent with results from 2003-2005.

Five-year soil test data indicates the values for pH, potassium, and phosphorus levels remain very similar between the two treatments (Table 2). These values are above the critical soil test level (per Tri-State Fertility Guidelines) specified for soybeans which is the planned crop for 2007 in this field.

Based on soil test data in 2002 and poultry litter analysis, a single 3.75 ton/acre application of poultry litter should supply phosphorus and potassium for three or more years in a corn, soybean,

and wheat rotation. At the time of poultry litter application, the poultry litter system cost \$20/ton which includes spreading charges. This equates to a per acre cost in this study of \$75/acre. The \$75/acre cost for the poultry litter system is for a multi-year period and as such will need to be divided by the number of years it supplies adequate phosphorus and potassium in order to determine the cost/acre/year for the poultry litter as a fertilizer source. The commercial fertilizer applied to cover the soil test requirements for phosphorus and potassium in the commercial treatments cost \$8.28/acre in 2002, \$7.53/acre in 2003, \$24.58 in 2004 and \$42.04/acre in 2005. Adding the application fee of \$4.50/acre/year, the total cost for the commercial fertilizer treatments for years 2002-2006 is \$100.43/acre.

Data summarized in this report is part of a multi-year study that compares a fertility program using commercial fertilizers to a fertility program using poultry litter as a phosphorus and potassium source. The study field was planted to corn in 2003, soybeans in 2004, wheat in 2005, and corn in 2006. It will rotate back to soybeans in 2007 as the trial continues in order to determine how many years the single poultry litter application of 3.75 tons/acre will supply adequate phosphorus and potassium for crop yields and soil test values to remain the same as with the commercial fertilizer system.

Acknowledgement

Poultry litter and application was provided by Mercer Landmark. The authors express appreciation to Dave Hanes, Mercer Landmark, for his cooperation with this study. Thanks also to Garst for supplying the seed, and to BASF and Bayer CropSciences for supplying the herbicides used in this study.