

Comparison of a Poultry Litter Fertilizer Program to a Commercial Fertilizer Program in Wheat

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Objective

This research was conducted to compare a fertility program using only commercial fertilizer 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:	none applied
Drainage:	Tile- nonsystematic	Insecticide:	none applied
Previous Crop:	Soybeans	Variety:	Croplan Genetics 569W
Tillage:	No-till	Row Width:	7.5 inches
Soil Test(2002):	pH 6.2, P 33 ppm, K 137 ppm prior to the start of this trial.	Planting Rate:	1,450,000 seeds/A
Fertilizer:	See Methods	Planting Date:	October 5, 2004
		Harvest Date:	July 7, 2005

Methods

This study is set up with two treatments replicated four times in a randomized complete 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 nitrogen fertilizer. 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 was 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. For the 2005 wheat crop, soil test results from the fall of 2003 were used to determine the amount of commercial fertilizer required to supply phosphorus and potassium for the non-poultry litter plots. This is due to the fact that in order to have timely planting of wheat following soybeans, it was not possible to wait for the 2004 soil test results to be returned from the lab. The non-poultry litter plot's commercial fertilizer consisted of 200 lb/acre of 0-26-26 which was surface broadcast on October 4, 2004. In addition to the 0-26-26 fertilizer on the commercial plots, all plots received 40 lb nitrogen/acre surface broadcast as urea prior to planting. All plots also received an additional 90 lb nitrogen/acre in the spring from urea topdress.

Harvest populations (June 17) were estimated by counting the number of wheat heads in a one foot section of row at 10 different locations in each individual plot. The average number of heads counted per one foot of row was converted to heads per square foot. Yields were collected from two combine rounds (56 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 were taken with a calibrated weigh wagon. Moistures were taken from the combine yield monitor. Yields reported in this study have been adjusted to a 13.5% moisture standard.

Results

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

Treatment	Harvest Population (heads/ft. ²)	Moisture (%)	Yield (bu/A)
Commercial P & K	54.8	14.3	78.4
Poultry Litter	54.7	14.2	72.0
LSD (0.05)	NS	NS	NS
F-test	<1	<1	3.1
CV (%)	11.5	3.8	6.9

NS= not significant

Table 2. Soil test data.

Treatment	2002	2003	2004	2005
	----- pH -----			
Commercial P & K	6.4	6.2	6.2	6.4
Poultry Litter	6.4	6.3	6.5	6.4
	----- Potassium (ppm) -----			
Commercial P & K	162.9	167.3	192.3	148
Poultry Litter	151.3	180.1	182.5	148
	----- Phosphorus (ppm) -----			
Commercial P & K	38.4	44.4	43.6	34
Poultry Litter	34.6	48.3	49.3	36

Summary

Results from this year's study indicate no statistical difference between the two treatments with regards to harvest population, moisture or yield. This data supports results from 2003 and 2004 that indicate no statistical difference with regards to harvest population, moisture or yield when corn (2003) and soybeans (2004) were the study crops.

Four-year soil test data indicates the values for pH, potassium, and phosphorus levels remain very similar between the two treatments. These values are also still well above the critical soil

test level (per Tri-State Fertility Guidelines) specified for corn which is the planned crop for 2006 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 sufficient phosphorus and potassium for three or more years in a corn, soybean, and wheat rotation. At the time of poultry litter application (spring 2003), 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, and \$24.58 in 2004. Adding the application fee of \$4.50/acre/year, the total cost for the commercial fertilizer treatments for the first three years (2002-2005) is \$53.89/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, and wheat in 2005. It will rotate back to corn in 2006 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.