POULTRY LITTER AS A FERTILIZER IN NO-TILLAGE CORN

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ABSTRACT: The poultry industry is thriving in Mississippi and along with this thriving industry comes an abundance of litter, which must be utilized in an environmentally friendly manner. We have realized the benefits of poultry litter to our traditional grass type forage crops for some time but little is known about how poultry litter will affect a forage crop such as corn. It is believed that poultry litter applied at the proper rate can be a valuable and environmentally friendly source of plant nutrients. At sixty-three days after planting, seventeen days after sidedress applications, corn height was at least 55 in for corn treated with preemergence litter at 200, 150, 100, and 50 lbs N/ac. Corn height was 58.4, 51.4, and 48.6 for preemergence litter at 50 lb N/ac followed by a sidedress application of commercial fertilizer at 150, 100, and 50 lb N/ac, respectively. Corn height ranged from 46.2 to 38.2 for all single sidedress applications of commercial fertilizer treatments, which was no different than the untreated check. The highest yield was 78 bu/ac with a single preemergence litter application of 150 lb N/ac. Yield ranged from 58 to 54 bu/ac with single sidedress application of commercial fertilizer at 50, 150, and 200 lb N/ac, but the 100 lb N/ac rate yielded 66 bu/ac. The preemergence litter followed by a sidedress application of commercial fertilizer treatment yielded from 67 to 73 bu/ac.

CITATION: M.W. Shankle, L. Oldham, and W. L. Kingery. 2002. Poultry Litter as a Fertilizer in No-Tillage Corn. Annual Research Report of the North Mississippi Research & Extension Center. Miss. Agric. & For Expt. Sta. Info. Bull. 386 pp. 36-38.

MATERIALS AND METHODS: A no-tillage corn fertilizer trial was established on an Atwood (fine-silty, mixed, thermic Typic Paleududalfs) to determine poultry use rates based on estimated available N content of poultry litter. Poultry litter nutrient analyses were conducted by the Plant and Soil Analysis laboratory at Dairyland Laboratories, Inc., 217 E. Main St., Arcadia, WI 54612. Analysis results estimated first year available N, P, and K to be 22.3, 26.7, and 30 lbs/ton, respectively, if applied to the surface and not incorporated (Table 1). Litter pH level was 7.96 and total carbon was 37%.

Table 1. Estimated nutrient content of chicken litter from the Donald Scott Farm at Pontotoc Co., MS in 2001.

Litter Nutrient	Nutrient Content	Estimated First Year Available Nutrients		Commercial Fertilizer Equivalent Value[1]	
		Inject or Incorp.	Surface/Not Incorp.	Injected or Incorp.	Surface/Not Incorp.
	----------Lbs/ton----------			----------$/ton----------	
N	44.6	26.8	22.3	8.83	7.35
P	48.6	26.7	26.7	6.68	6.68
K	40.0	30.0	30.0	4.20	4.20

[1]Values based on N (Urea) $0.33/lb, P_2O_5 (Triple Superphosphate) $0.25/lb, and K2O (Potash) $0.14/lb commercial fertilizer costs on January 12, 2001.

Litter treatments included 2.2, 4.5, 6.7, and 9 ton /ac, which was equivalent to 50, 100, 150, and 200 lb N/ac (Table 2). Commercial fertilizer treatments included 14.1, 28.2, 42.4, and 56.5 gal /ac of 32% UAN solution, which is also equivalent to 50, 100, 150, and 200 lb N/ac. Combination treatments of preemergence (PRE) litter followed by (f/b) sidedressed (SD) 32% UAN fertilizer included PRE 2.2 ton/ac litter f/b a SD application of either 14.1, 28.2, or 42.4 gal/ac 32% UAN solution, which is equivalent to 50 f/b 50, 100, or 150 lb N/ac, respectively.

Prior to planting, P_2O_5 and K_2O fertilizer was applied according to Mississippi State University Soil Testing Laboratory recommendations to plots receiving commercially available 32% UAN. The P and K levels in all other

plot soil were considered sufficient based on litter P and K levels. A uniform lime treatment was applied to the entire trial area according to soil test recommendations. A preplant burndown application of 1 lb ai/ac glyphosate plus 0.5 lb ai/ac 2,4-D Amine was applied at 2 weeks before planting. The experiment design was a randomized block with 4 replications. Plot size was 15 x 40 ft. Pioneer 32K64 corn was planted in 30 in rows and a T-band treatment of 1.23 lb ai/ac chlorpyrifos was applied on April 9. Immediately after planting, a preemergence (PRE) treatment of 1.8 lb ai/ac atrazine plus 1.0 lb ai/ac metolachlor was applied. On April 12, litter treatments were manually surface applied to the appropriate plot area. On April 27, a postemergence treatment of 0.047 lb ai/ac nicosulfuron was applied for johnsongrass (*Sorghum halepense*) control. On May 25, SD treatments of commercial 32% UAN were applied (6 in from row and 2 in deep) to 6 to 8 leaf stage corn. Plant height and SPAD (chlorophyll content) measurements were collected throughout the growing season (Table 2). The two center rows of each plot were harvest on September 6. Corn grain from each plot was weighed and seed moisture was determined using a MT3 Farmex grain moisture tester. Yield was adjusted to 15% moisture. Statistical analyses were conducted and means were separated using Fishers protected LSD (α=0.05). Soil samples (0-6 in) were collected from each plot following harvest to determine residual soil nutrient status.

Table 2. Treatments to determine poultry litter use rates in no-tillage corn production based on estimated available N content of poultry litter at Pontotoc Ridge-Flatwoods Experiment Station in 2001.

Chicken Litter Planting	32% UAN Sidedress	Plant Height 5/09/01	Plant Height 5/23/01	Plant Height 6/11/01	Est. Chlorophyll 6/11/01	Yield
----------Lbs N/ac----------		----------Inches----------				Bu/ac
50	0	12.1	21.5	65.0	50.6	64
100	0	12.8	25.1	55.3	52.0	66
150	0	13.1	28.1	66.3	52.2	78
200	0	12.1	25.5	71.8	52.6	59
0	50	10.4	17.9	38.2	53.0	54
0	100	10.8	18.6	42.9	53.7	66
0	150	10.3	15.8	44.6	53.5	58
0	200	10.1	17.5	46.2	54.0	58
50	50	11.1	17.6	48.6	52.5	67
50	100	11.5	21.3	51.4	53.2	73
50	150	12.1	19.1	58.4	53.0	67
Untreated	Untreated	9.5	15.6	36.3	47.2	40
LSD (α=0.05)		1.4	3.3	12.5	1.4	16

RESULTS AND DISCUSSION:

At 30 DAP, plant height for corn treated with PRE litter ranged from 11 to 13 in compared to 9.5 to 10.8 in corn yet to receive N fertilizer. At 44 DAP, plant height was at least 25 in for corn treated with PRE litter at 100, 150, and 200 lbs N/ac. Corn was less than 22 in for all other treatments and the untreated check was 15.6 in. At 63 DAP and 17 days after SD, corn height was at least 55 in for corn treated with PRE litter at 200, 150, 100, and 50 lbs N/ac. Corn height was 58.4, 51.4, and 48.6 for PRE litter at 50 lb N/ac f/b SD commercial fertilizer at 150, 100, and 50 lb N/ac, respectively. Corn height ranged from 46.2 to 38.2 for all single SD commercial fertilizer treatments, which was no different than the untreated check.

At 63 DAP, estimated chlorophyll levels were greater in plants with SD commercial fertilizer compared to PRE litter for single application rates of 100 and 50 lb N/ac. However, estimated chlorophyll levels for single applications of 200 and 150 lb N/ac rates from both sources were not different. In addition, all litter and SD treatment combinations were equivalent to 150 lb N/ac rates from both sources.

Corn yields ranged from 78 to 54 bu/ac for all N treatments, which was greater than the untreated check except for the 50 lb N/ac commercial SD application. Low yields may be related to environmental conditions since total rainfall from June 9 through July was less than 2 in. The highest yield was 78 bu/ac with a single PRE litter application of 150 lb N/ac. Yield with single PRE litter applications of 50, 100, and 200 lb N/ac ranged from 66 to 59 bu/ac suggesting that the 200 lb N/ac may cause excessive vegetative growth. Yield ranged from 58 to 54 bu/ac

with single SD commercial fertilizer at 50, 150, and 200 lb N/ac, but the 100 lb N/ac rate yielded 66 bu/ac. The PRE litter f/b SD commercial fertilizer treatment yields ranged from 67 to 73 bu/ac.

Soil samples were collected after harvest to compare nutrient levels and other soil characteristics among treatments (Table 3). We anticipated a liming effect from the addition of litter, but soil pH was no different among treatments after the first growing season. In addition, boron and sulfur were not different among treatments (data not presented). Higher levels of P, K, Cu, Fe, and Zn were determined for soil treated with litter at 200 lb N/ac, but these elements were not present at levels different than the untreated check in soil treated with litter at 50 lb N/ac. In addition, total soil nitrogen level and OM content in soil treated with litter was not different than the untreated check. These preliminary results suggest that a starter fertilizer treatment may be beneficial with SD commercial fertilizer treatments. This could be achieved by using a PRE litter f/b SD commercial treatment. The use of litter as a starter fertilizer source at approximately 2 ton/ac instead of a total N source at 4 to 9 tons/ac should minimize environmental concerns and provide an alternative disposal method for the poultry production industry.

Table 3. Soil characterization after harvest in no-tillage corn production at the Pontotoc Ridge-Flatwoods Experiment Station in 2001.

Chicken Litter Planting	32% UAN Sidedress	pH	Phosphorus	Potassium	Copper	Iron	Zinc	Total Kjeldahl Nitrogen	Organic Matter
--------Lbs N/ac-------			----------ppm----------						%
50	0	5.75	35.5	142.0	1.60	88.0	2.00	982.0	0.85
100	0	5.70	37.0	119.0	1.95	77.0	2.75	1258.5	1.00
150	0	5.65	54.0	149.5	2.90	77.5	3.45	1830.0	1.15
200	0	5.45	78.0	234.5	3.30	88.5	3.45	1467.5	1.45
0	50	6.15	36.0	161.5	1.00	83.0	1.90	1547.5	0.85
0	100	5.95	71.5	156.5	0.95	85.5	1.40	1384.0	1.05
0	150	5.90	34.0	138.0	1.05	74.5	1.40	949.5	0.90
0	200	5.40	28.5	121.5	0.80	71.0	1.35	1062.0	1.05
50	50	5.60	37.0	146.0	1.65	68.0	2.20	1118.5	1.45
50	100	5.60	35.5	147.0	1.65	71.5	2.20	1037.0	1.00
50	150	5.55	29.0	144.5	1.65	77.0	2.05	1234.0	1.05
Untreated	Untreated	5.65	21.5	143.0	1.20	75.0	1.85	1416.5	1.05
LSD (α=0.05)		0.6	32.0	58.5	1.2	15.7	1.3	717.4	0.4

COOPERATORS: Donald Scott, Mississippi poultry producer, Pontotoc, MS