EVALUATION OF CHICKEN LITTER AS A NITROGEN SOURCE FOR COTTON

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ABSTRACT: Expansion of broiler production in South Central Mississippi has leveled off in the past years. This is partially due to state mandates for nutrient management planning, where application rates of litter are restricted to the level of crop or forage removal. New land areas and data for crop response to litter applications are needed in order for the broiler industry to continue expanding in Mississippi. The objective of our study was to evaluate chicken litter as a nitrogen source on cotton. The study was conducted on the North Mississippi Branch Experiment Station at Holly Springs, Mississippi. Topography of the land is an upland with 3 to 5 percent slope. Soils are a Grenada silt loam (fine silty, mixed thermic Glossic fragidualf). Plot area was fertilized according to soil test recommendations with P and K in late March. Fragipan depths ranged from 12 to 14 inches within the study area. The experimental design was a split plot in a randomized complete block with three replications. Main plots consisted of two tillage types (conventional-till and no-till), with subplots having five nitrogen rates. Row widths were 38 inches and plot lengths were 50 feet. Plots consisted of four rows. Plots were planted the first week of May in a Roundup Ready variety of cotton with a four-row planter equipped for no-till planting. No-till plots were sprayed with a burndown in early April. Tillage for conventional-till plots was made the same day as the burndown application. Roundup (glyphosphate) was sprayed postemergence for weed control three weeks after planting. A second application of Roundup sprayed post direct at the base of the plant was made in the last week of June. Five application rates were studied consisting of chicken litter at two tons per acre and ammonia nitrate at 0, 30, 60, and 90 pounds per acre applied the first week of June. The litter and the inorganic nitrogen were left undisturbed on the soil surface of the no-till plots. In the conventional-till plots a cultivation was made after litter and nitrogen application. Petiole sap analysis was significantly higher in the chicken litter plots than the 0 and 30 pound level in the inorganic nitrogen plots the first week of bloom. Petiole sap analysis was made using a hand held Minolta No3-N meter. In the fourth week of bloom the petiole sap analysis for the litter treatment was higher than the 0 and 90 pound level in the inorganic nitrogen plots. Leaf fluorescence at the first and fourth week of bloom was higher for the litter than the 0 level on inorganic nitrogen. Yields were significantly higher for the litter treatment than the 0 and 30 pound level of inorganic nitrogen.

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MATERIALS AND METHODS: In the fall of 2000, the cotton stalks were shred immediately after harvest. The plot area was subsoiled immediately after cutting stalks. Roundup (glyposate) 1.0-lb ai/ac was sprayed over the entire plot area the first week of April. A commercial blend of fertilizer 0-80-80 was broadcast over the entire plot area in mid-April. Delta and Pine Land DPL 451 BG/RR was planted on May 2 at the rate of four seeds per foot of row spaced on 38 in centers. Terrachlor Super X 18.8G (Pentachloronitrobenzene) 1.5 lb ai/ac + Temik 15G (aldicarb) 0.75lb ai/ac were applied as granules in furrow at planting. Cotoran (fluometuron) and Graxamone (paraquat) at 1.0 lb ai/ac + 0.625 lb ai/ac were broadcast sprayed over the entire plot area after planting. Bidrin (dicrotophos) 0.2 lb ai/ac was applied at 4, 6, and 8 weeks after planting. Staple (pyrithiobac) at 0.06 oz ai/ac was mixed in 20 gallons of water and sprayed broadcast over entire plot area six weeks after planting. Cy-Pro (cyanazine) at 1.0 ai/ac and MSMA (MSMA) at 1.25 lb.ai/ac was post-direct sprayed over the plot area as a layby treatment. Nitrogen fertilizer rates 0, 30, 60, 90, and 120 lb/ac were evaluated to determine the optimum nitrogen level to achieve the highest possible yield. Cotton was defoliated on September 11 with Superboll (e thephon) 1.5 lb. ai/ac + Def 6 (tribufos) 1.5 lb ai/ac. Harvesting was done with a plot picker modified with an automatic weight and data storing system.

Nitrogen was applied using a tractor mounted Gandy applicator calibrated for each N rate. Ammonium nitrate (34% N.) was the source of nitrogen. Nitrogen was placed approximately one foot from the drill and two inches below the surface. All nitrogen was applied after emergence and before match head squares were present. Chlorophyll

fluorescence measurements were made using a Minolta Spad 502 hand held fluorescence meter on the leaves of twenty plants selected at random within each plot and averaged across the plants for a single plot reading. Leaf readings were taken on the fifth expanded leaf below the terminal of the plant. Chlorophyll fluorescence measurements were made at first week of bloom, second week of bloom and fourth week of bloom. Twenty petioles were collected from the same leaf the chlorophyll fluorescence readings were taken from, of each plant, of each plot, of each treatment, and each replicate for evaluation of NO3-N status using a Minolta hand held nitrogen meter. Samplings of petioles were made at first week of bloom and fourth week of bloom. Petioles were collected from the fifth fully expanded leaf on the main stem below the plant terminal. Petioles were frozen immediately after collection. Analysis was conducted in an air-conditioned laboratory twenty-four hours after collection. This hopefully eliminated a variation in the meter reading from exposure to sunlight or temperature variation. Petiole sap was extracted by thawing the petioles under an infrared light for five minutes before the stems were cut into lengths of approximately one inch. Petiole sap was extracted by placing the cut petiole stems into garlic press and squeezing out the petiole sap. One milliliter+ of sap was squeezed into a test tube from a composite of the twenty petioles of each plot. Two or three drops of sap from each test tube were placed on the calibrated meters. Meter calibration was checked by running a standard at the start of each test period and after
every twenty samples.

RESULTS AND DISCUSSION: Soil temperature and moisture were favorable for good germination and excellent cotton stands in 2001. Early summer was clear and very few clouds resulting in good plant growth. The plants started blooming the last week of June and excellent boll set was obtained by the middle of July. Soil moisture was favorable with no prolonged drought period resulting in an excellent crop. Average petiole NO3-N sap measurements were significantly lower at the 90 lb level at first week of bloom than for the 0, 30, and 60 lb N level (Figure 1). At the fourth week of bloom the NO3-N sap measurements increased significantly between the zero level and the 60-lb. level (Figure 2). Chlorophyll fluorescence measurements made in this study were not very sensitive to levels of nitrogen above 30 pounds per acre (Figures 3 and 4). Yields were higher for the broiler litter than the 0 and 30-lb. nitrogen level (Figure 5).

Figure 1. Petiole NO3-N Sap Analysis at the First Week of Bloom.

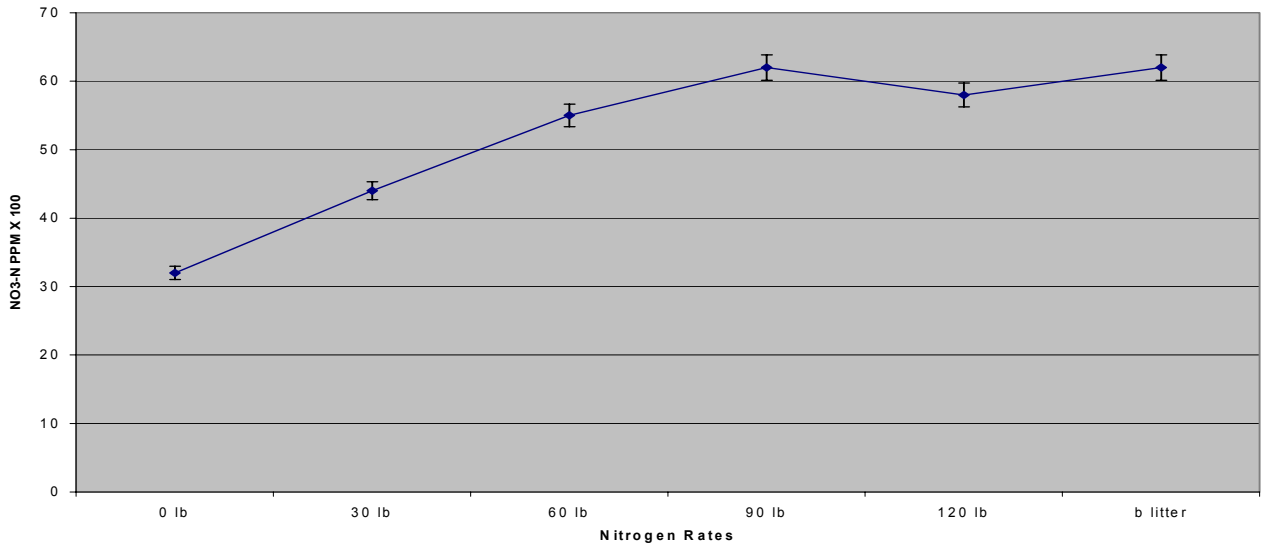

Figure 2. Petiole Sap Analysis at the Fourth Week of Bloom.

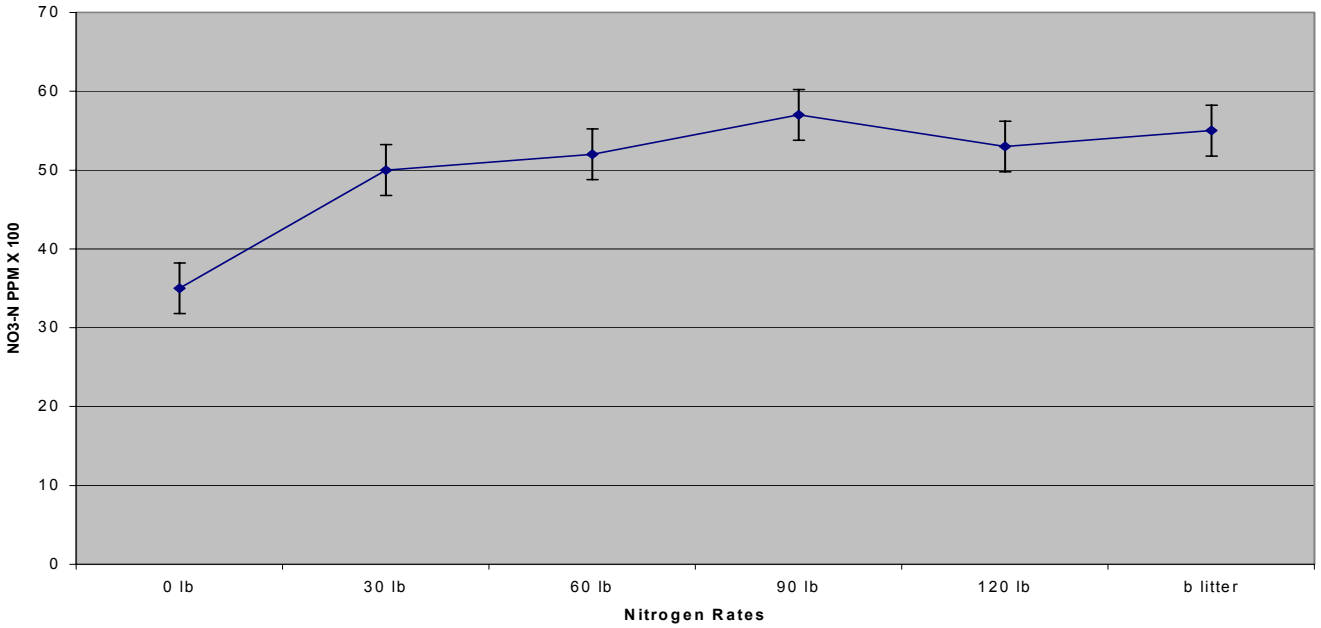

Figure 3. Leaf Fluorescense Reading at the First Week of Bloom

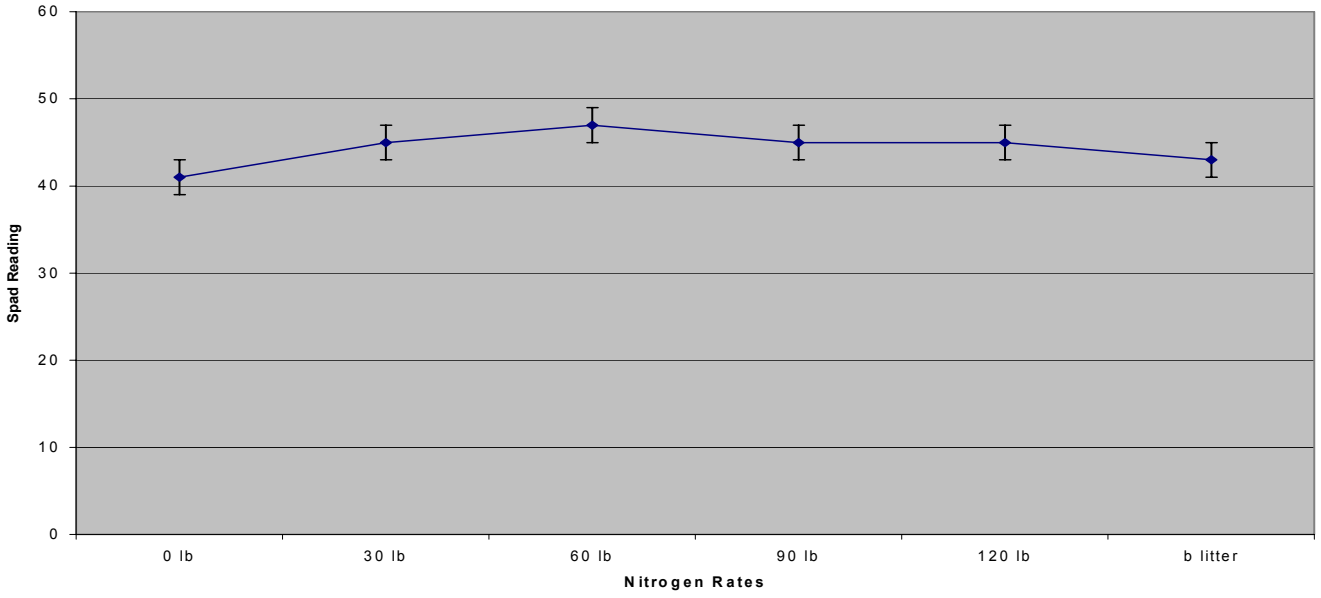

Figure 4. Leaf Fluorescense Reading at the Fourth Week of Bloom.

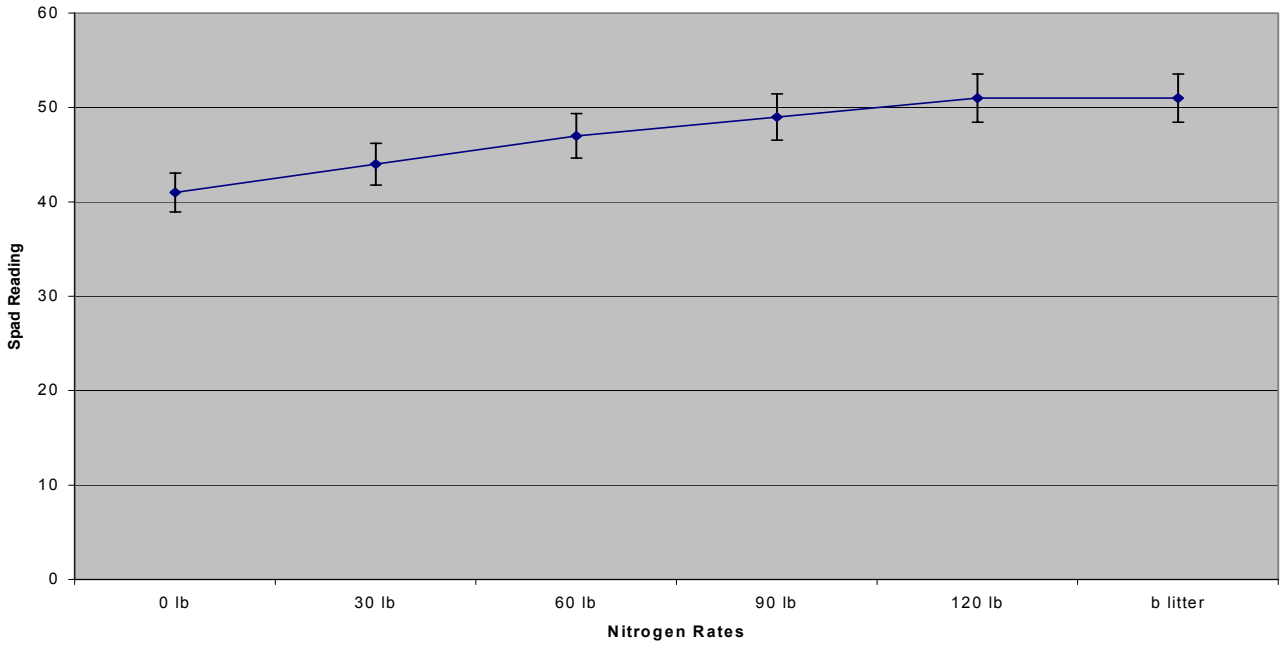

Figure 5. Lint yield of cotton grown using different sources and rates of nitrogen.