

## Factors Affecting the Nutrient Content and Composition of Poultry Litter

The poultry industry in Alabama is comprised primarily of broiler production. Hence, broiler litter is the number one poultry waste generated in the state. Land application of litter to forages and row crops are a viable option for utilizing this valuable resource. With escalating fertilizer prices, farmers are developing a renewed interest in litter for its nutrient value. The litter is also considered a soil builder because it helps to improve soil organic matter content of highly weathered soils. Furthermore, it improves soil microbial activity and helps to increase overall soil health. However, the nutrient content of litter can be extremely variable. This publication provides an overview of poultry litter and the factors that cause variations in litter nutrient content.

### What is poultry waste made up of?

Poultry litter coming from broiler houses is typically comprised of chicken feces and urine mixed with bedding materials (Figure 1). Some common bedding materials used in broiler houses are sawdust, pine shavings, and peanut hulls. The litter may also contain feathers and spilled feed but usually in very small amounts. The poultry waste coming from layer hen houses consists of chicken feces and urine.



**Figure 1.** Broiler litter inside a poultry mega-house (left) and caked litter stored in a dry-stack barn (right).

### **What nutrients are typically present in broiler litter?**

Broiler litter contains 11 essential plant nutrients (Table 1). The amount of nutrients provided by litter depends on the nutrient content of the litter and the amount applied.

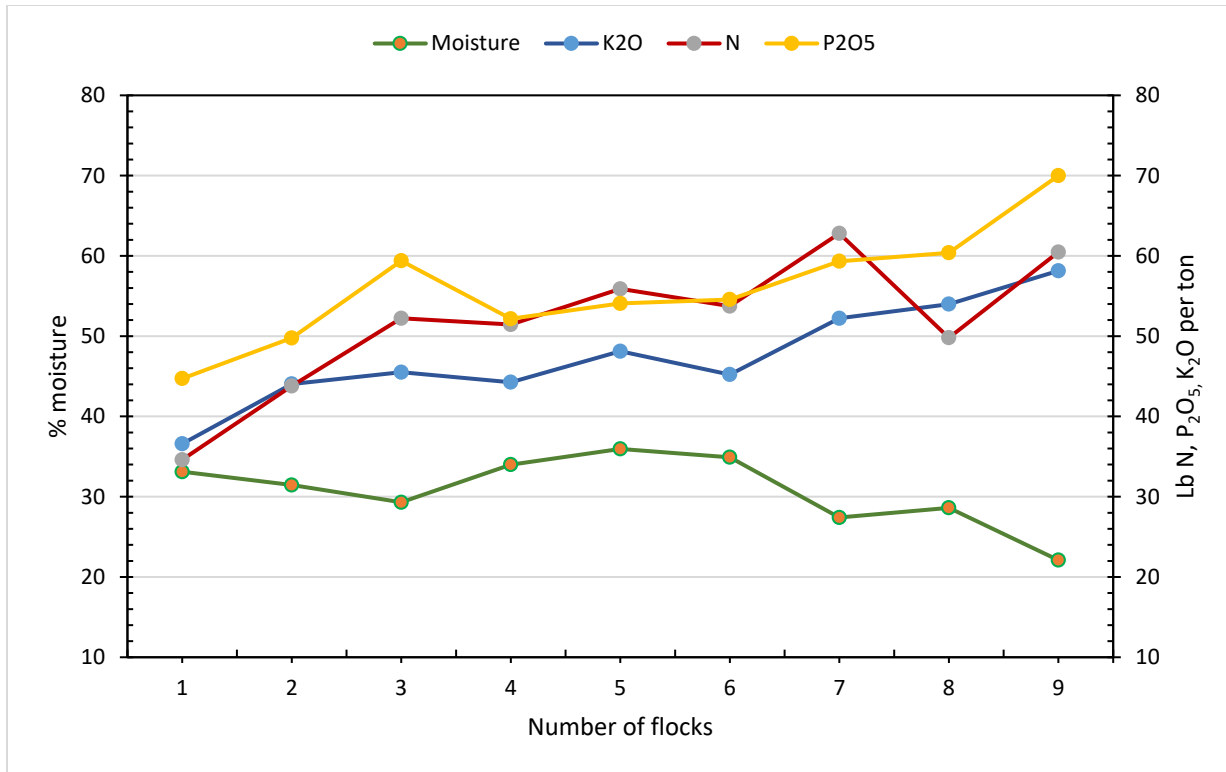
**Table 1.** Nutrients typically present in broiler litter

Primary Plant Nutrients	Secondary Plant Nutrients	Micronutrients
Nitrogen (N) Phosphorus (P <sub>2</sub> O <sub>5</sub> ) Potassium (K <sub>2</sub> O)	Calcium (Ca) Magnesium (Mg) Sulphur (S)	Copper (Cu) Iron (Fe) Manganese (Mn) Zinc (Zn) Boron (B)

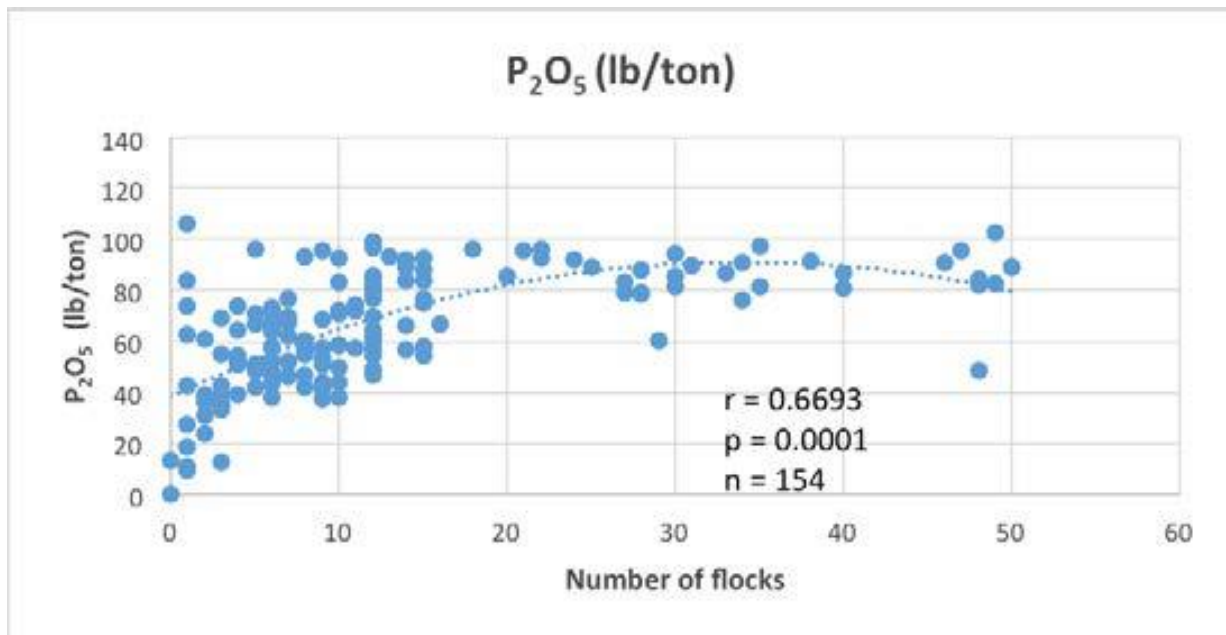
The Auburn University Soil Testing Laboratory can provide a detailed analysis of the nutrient content of poultry litter. It is critical that a representative sample be collected in order to receive the most accurate results. Contact your local County Extension office for more information or go to the AU Soil Laboratory website at: <http://www.aces.edu/anr/soillab/forms/index.php>

### **What causes variations in broiler litter nutrient composition?**

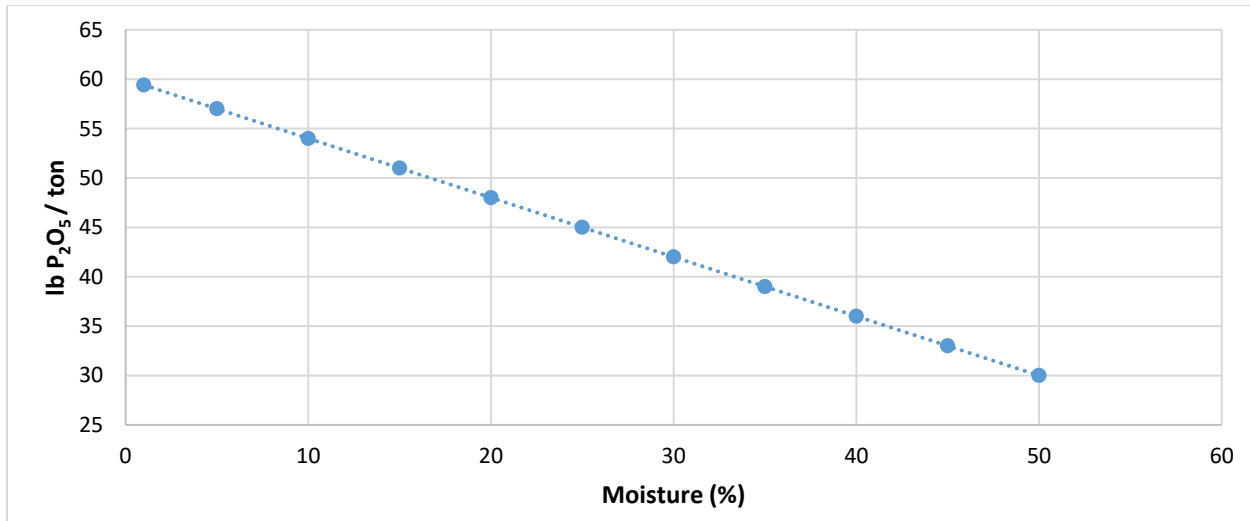
- 1. Age of litter/length of storage.** Nitrogen and other nutrient values are lost when poultry litter sits in a storage barn for a long period of time, such as during a disease breakout season.
- 2. Number of flocks between cleanouts.** Poultry litter from a house cleaned after two flocks will have less nutrients compared to a house cleaned after nine flocks (Figure 2a). The nitrogen content generally increases and peaks after five flocks (VanDevender et al., 2000). The phosphorus content increases with the number of flocks since phosphorus excreted by birds remains in the litter and, unlike nitrogen, does not get lost via gaseous pathway (Figure 2b). The potassium content also increases with increase in number of flocks (Figure 2a).
- 3. Amount and type of bedding material:** Litter with larger wood shavings will have less nutrient content per unit weight compared to finer shavings. Similarly, if large quantities of peanut hulls are used as a bedding material and houses are cleaned out in shorter time periods (e.g. between two flocks or emergency cleaning of a fresh batch due to a disease breakout), the nutrient content per unit weight will be less.
- 4. Moisture content:** Moisture content of litter can change the nutrient content per unit weight. The nutrient content of litter decreases as its moisture percentage increases. Similarly, as the litter dries out or loses moisture, its nutrient content increases. For example one ton of litter at 25 % moisture will deliver less nutrients than one of ton of the same litter at 15% moisture. The following graph (Figure 3) shows the relationship between nutrient concentrations at different litter moisture percentages. Assuming, one ton of dry litter (moisture % close to zero) contains 60 lbs of P<sub>2</sub>O<sub>5</sub>, the same amount of litter will contain 54 lbs P<sub>2</sub>O<sub>5</sub> at 10% moisture, and 48 lbs P<sub>2</sub>O<sub>5</sub> at 20% moisture.



**Figure 2a.** Nutrient content of nine flocks of six-week birds grown on the same litter. Remember fertilizer recommendations or grades are given in P<sub>2</sub>O<sub>5</sub> (Adapted from Sharpley et al., 2009).



**Figure 2b.** Effect of number of flocks on P<sub>2</sub>O<sub>5</sub> content (lb/ton) of litter (Adapted from Tabler et al., 2018)



**Figure 3.** Relationship between litter moisture percentage and nutrient concentration.

**5. Litter pH.** Litter pH is an important factor that drives ammonia volatilization. If litter pH >8, the nitrogen value of litter decreases since a larger proportion of ammonium-N exists as ammonia gas and gets volatilized during or after surface application to field. Incorporation of litter into soil immediately after application generally reduces ammonia volatilization by greater than 90%.

**6. Other factors.** The nutrient content of litter may also vary from one poultry operation to another. The variation may come from number of birds per house, feed ration, type of housing systems (older houses vs new houses), and whether bedding was pulverized, windrowed or de-caked between flocks.

The nutrient content of poultry litter is variable and should be sampled regularly and analyzed to determine the exact nutrient concentration before application to fields. Litter testing ensures the most effective use of nutrients in litter that also protects the environment. Regular analysis of litter is an important part of sound nutrient management and an overall good farm practice.

**References:**

Sharpley, A., N. Slaton, T. Tabler, K. VanDevender, M. Daniels, F. Jones and T Daniel. Nutrient Analysis of Poultry litter. Arkansas Coop. Ext. Ser. FSA9529. University of Arkansas, Little Rock, Arkansas.

Tabler, T., A.B. Johnson, G, Hagood, M. Farnell, C. McDaniel, and J. Kilgore. Nutrient Content in Mississippi Broiler Litter. Publication 2878. Mississippi State University Extension Service.

VanDevender, K., J. Langston and M. Daniels. 2000. Utilizing dry poultry litter – An overview. Arkansas Coop. Ext. Ser. FSA8000. University of Arkansas, Little Rock, Arkansas.

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