UtahStateUniversity
COOPERATIVE EXTENSION

NUTRIENT CONTENT OF UTAH TURKEY LITTER

David D. Frame, DVM, Extension Poultry Specialist
USU Turkey Research Center, Ephraim, UT 84627

Gary L. Anderson, MS
Sanpete County Cooperative Extension, Ephraim, UT 84627

Reviewed June 2010

An estimated 60,000 cubic yards (24,700 tons) of turkey growout litter is produced annually in Utah. Most is destined for land application on commercial cropland or pastureland. Comprehensive Nutrient Management Plans (CNMP's) for livestock and poultry operations require that conscientious and appropriate procedures be followed for the removal, disposal, and land application of animal waste. It is important that turkey growers know the nutrient content of their litter before applying it to their own land or selling it to others.

This fact sheet serves as a guideline and summary for Utah turkey producers, emphasizing those things most important in manure management of any kind: water (H_2O), pH, nitrogen, phosphorus (measured as P_2O_5), and potassium (measured as K_2O). Although we focused on the major items important in CNMP's, a battery of other element and mineral analyses were also included to give as complete a profile as possible of the litter. All analytic work was done at the Utah State University Soils Laboratory in Logan, Utah.

To determine the average nutrient content of Utah turkey litter, we sampled litter from various areas in the Sanpete Valley. The sample pool consisted of 42 growout, 5 brooder, and 6 pine shavings. Pine shavings are the most commonly available type of wood shavings in Utah. Even though brooder litter and straight shavings are rarely applied to cropland, including these results gives a reference from which to compare the growout litter.

Most samples were taken from litter piled outside the building within a few weeks of cleanout. A few were collected from litter still in the building, but taken immediately after turkeys were removed for processing. Samples of straight shavings were collected before any turkeys were placed in the building.

Samples were collected at two times of year (March to June and September to October) to determine possible seasonal variation. As many samples as possible were taken in the spring and fall from the same growers for comparison.

MOISTURE

Percent moisture and moisture content were collected for the three classes of litter samples (i.e., straight shavings, brooder litter, and growout litter). Percent moisture of straight shavings was 14%; brooder litter, 13%; and growout litter, 19.7%. Table 1 lists the mean

("average") and upper and lower 95% confidence interval (CI) for the mean for percent moisture and lbs per ton moisture on an "as-is" basis (i.e., ready-to-spread).

Table 1. Moisture content of litter samples.

	Percent moisture, dry matter basis			Lbs moisture per ton ("as-is")		
Sample type	Lower CI	Mean	Upper CI	Lower CI	Mean	Upper CI
Shavings	12.3	14.0	15.7	246	280	314
Brooder litter	4.0	13.0	22.0	75	259	443
Growout litter	18.2	19.7	21.1	343	371	400

pH

The pH differed slightly between groups. There was a significant difference ($p < 0.05$) in pH between shavings and growout litter. Brooder samples ranged from a low of 6.2 to a high of 6.5. Growout samples ranged from 5.6 to 7.5. The mean and 95% CI for the three sample types are listed in Table 2.

Table 2. Mean pH of litter samples.

SAMPLE TYPE	LOWER CI	MEAN	UPPER CI
Shavings	4.5	5.4	6.3
Brooder litter	6.2	6.4	6.6
Growout litter	6.5	6.6	6.7

NITROGEN

Uncontaminated shavings contain negligible amounts of nitrogen. Average nitrogen content in brooder litter was between 37 and 60 lbs per ton. Average nitrogen in ready-to-spread growout litter was between 64 and 73 lbs per ton. (See Table 3.) Nitrogen content did not significantly vary between spring and fall.

One interesting finding, illustrated in Figure 1, was that increasing the number of flocks grown on the litter showed no significant association with increased nitrogen yield ($r = 0.08$). This is important to the producer because one cannot assume that a pile of growout litter having had only one flock grown on it is significantly less "hot" in nitrogen density than litter having had multiple flocks raised on it.

[1] The confidence interval (abbreviated as CI) is a good way to describe the likelihood of the average (the correct statistical term for this measurement is *mean*) of something, such as moisture, nitrogen, etc., falling within a range of values. The low and high 95% CI's simply indicate that there is a 95% chance that the "true" mean actually falls within this range.

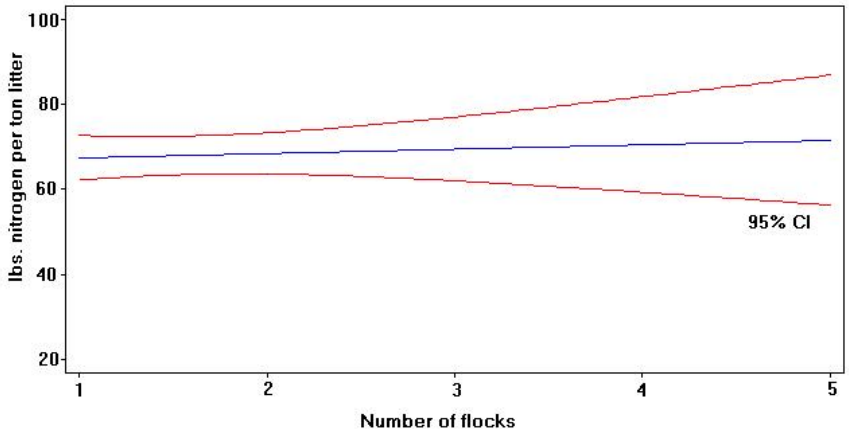

Figure 1. Regression line for the mean and 95% CI for lbs nitrogen per ton litter compared with number of flocks that had been raised on the growout litter.

PHOSPHORUS

Phosphorus content varied less than nitrogen, and is reported as the yield of inorganic phosphate (P_2O_5). Shavings contained negligible amounts of P_2O_5. Average P_2O_5 content in brooder litter was between 23 and 43 lbs per ton. Average ready-to-spread growout P_2O_5 was between 67 and 75 lbs per ton litter. (See Table 3.)

OTHER MINERALS/ELEMENTS

No significant differences or correlations were found for potassium (K_2O), calcium, magnesium, sodium, sulfur, boron, zinc, copper, iron, or manganese when comparing these elements seasonally or to number of flocks raised on the litter. (See Table 3.)

TYPICAL LOAD OF READY-TO-SPREAD UTAH TURKEY LITTER

In summary, each ton of average Utah turkey litter contains the following lbs of minerals and trace elements:

Boron…….	0.1	Phosphorus (P_2O_5) …	71
Calcium……..	50	Potassium (K_2O)……	36
Copper……	0.6	Sodium……...	5
Iron…….	1.8	Sulfur…….	6.5
Magnesium…….	10	Water…….	371
Manganese…….	0.5	Zinc……	0.6
Nitrogen …….	68		

SUMMARY

This fact sheet reports the mean and 95% CI of Utah turkey growout litter nutrient content. The sample pool is large enough to demonstrate that the concentration of the most influential elements and minerals can be safely estimated within a certain range of values. These values may be beneficially used by regulatory organizations, such as the Natural Resources Conservation Service, to assist growers in managing their CNMP's. Number and frequency of manure samples may be reduced because of the relative consistency in nutrient content from one

load to another, thereby minimizing the expense of litter analyses to the grower. More effort may then be focused on soil sampling.

Table 3. Turkey growout litter on a ready-to-spread basis – mean and 95% CI for various minerals (lbs/ton).

ELEMENT	LOWER CI	MEAN	UPPER CI
Nitrogen	64	68	73
Phosphorus (P_2O_5)	67	71	75
Potassium (K_2O)	34	36	38

Table 4. Turkey growout litter on a ready-to-spread basis – mean and 95% CI for other minerals and trace elements (lbs/ton).

ELEMENT	LOWER CI	MEAN	UPPER CI
Calcium	43	50	58
Magnesium	8	10	13
Sodium	4.6	5.0	5.4
Sulfur	6.2	6.5	6.9
Boron	0.08	0.09	0.10
Zinc	0.52	0.57	0.62
Copper	0.54	0.58	0.62
Iron	1.33	1.85	2.37
Manganese	0.43	0.46	0.48

Utah State University is committed to providing an environment free from harassment and other forms of illegal discrimination based on race, color, religion, sex, national origin, age (40 and older), disability, and veteran's status. USU's policy also prohibits discrimination on the basis of sexual orientation in employment and academic related practices and decisions.

Utah State University employees and students cannot, because of race, color, religion, sex, national origin, age, disability, or veteran's status, refuse to hire; discharge; promote; demote; terminate; discriminate in compensation; or discriminate regarding terms, privileges, or conditions of employment, against any person otherwise qualified. Employees and students also cannot discriminate in the classroom, residence halls, or in on/off campus, USU-sponsored events and activities.

This publication is issued in furtherance of Cooperative Extension work. Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Noelle E. Cockett, Vice President for Extension and Agriculture, Utah State University. (AG/Poultry/Waste Management/01)