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1998 Summary of Poultry Litter Samples in Oklahoma

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Introduction

Like many states, Oklahoma is addressing the questions of animal waste nutrients and their effects on the environment, especially in regard to water quality.

A report by the Oklahoma Conservation Commission listed animal nutrients as a major concern for the quality of water in Lake Eucha, one source of water for Tulsa, the second largest city in Oklahoma. A segment of the report addressed the concern of land application of poultry litter from the growing eastern Oklahoma poultry industry. The report, combined with citizen and entity complaints concerning the rapid increase of swine numbers in western Oklahoma, generated large amounts of publicity and political concern.

The governor of Oklahoma, Frank Keating, appointed a committee of 15 persons, representing government agencies and private individuals, to develop and compile recommendations to be presented to the legislature. This committee met numerous times, conducted fact finding tours, gathered information from a variety of sources, and compiled a list of recommendations. The recommendations primarily addressed the poultry and swine industry.

The recommendations were presented to the legislature to aid in drafting legislation during the 1998 legislative session. The animal waste issue became one of the dominant topics of the session and resulted in the formation of laws concerning this issue. One requirement of this legislation was that all poultry producers would sample their litter annually before spreading in phosphorus threatened watersheds (Lake Eucha, Illinois River, and Wister Lake). Poultry producers must sample every three years in watersheds that have not been identified as phosphorus threatened.

Prior to this legislation, the Oklahoma Department of Agriculture had issued emergency rules that required this litter sampling. The OSU Cooperative Extension Service also conducted a series of meetings to introduce sampling procedure, benefits of sampling, and related topics to poultry producers.

Procedure

A majority of poultry production occurs in eight (8) counties in eastern Oklahoma. These are Adair, Craig, Delaware, Haskell, Leflore, Mayes, and McCurtain. Leflore and McCurtain counties are the two largest poultry producing counties with combined production of over 100 million birds annually. The above mentioned counties handled approximately 390 litter samples in the spring of 1998. These samples consisted of broiler (329), broiler breeder (52), and pullet (9) litter samples.

The University of Arkansas Agricultural Diagnostic Services Laboratory analyzed all samples. Extension-sponsored educational meetings taught producers sampling procedures. Additionally, local extension agricultural educators provided technical assistance to producers with written and personal instruction. The local conservation districts also provided assistance to producers by collecting some of the samples. However, there was no effort to control or document sampling techniques or methods. The age or source of litter samples was not verified.

Interpreting Results

Important considerations for litter analysis are moisture, nitrogen, phosphorus, potassium, and calcium. Moisture is important due to the added weight high moisture will add to the hauling cost and its effect on litter quality. The levels of nitrogen, phosphorus, and potassium are important to be able to satisfy plant requirements and meet current regulations of nutrient amounts (particularly phosphorus) that can be applied. The calcium present in litter is important for its liming value. It has been estimated that the calcium can add $2 of value to each ton of litter.

Results were broken down into type (broiler, broiler-breeder, and pullet) and by county in regard to broiler litter only.

Conclusion

Variations occur in litter due to bird type, feeding regimen, and house management. This summary is not intended to

replace sampling, which under current law is required. As the monetary and regulatory value of sampling becomes more widespread, it is hoped that sampling methods will become more standardized, therefore making results more comparable. Much effort has occurred to move litter out of threatened watersheds, and this summary has value to the potential outside buyer as an expectation of the nutrients they will receive from a given bird type and given county area. The buyer will also receive an approximation of the moisture level that will contribute to trucking costs. The summary also has value as a resource guide to agencies and individuals who are continuing to study animal waste issues.

An average for nutrients in all counties and a comparison of the three types of litter are shown in Table 1. As expected, due to the housing systems, broiler breeder litter is significantly higher in moisture than broiler and pullet litter ($P < .05$). Dietary factors lead to significantly higher nitrogen in broiler litter than breeder and pullet litter. This is due to the higher protein diets fed to broilers compared to pullets and breeders. Calcium content is significantly higher in breeder hen litters than broiler and pullet litters. Calcium content of layer diets is formulated to be several times higher than growing bird diets.

Based on the phosphorus and nitrogen contents of the litter types and the new regulations requiring application rates based on NRCS guidelines, relative values can be placed on each litter type (Table 3). If application rate is limited to 200 pounds of P_2O_5 per acre per year, then the following nitrogen levels will be applied for each litter type.

Table 3. Estimation of relative litter value based on application rate limitations and nutrient content.

Litter Type	*Application Rate**	*lbs./acre N applied***
Broiler	3.4	199.7
Breeder Hen	3.2	129.0
Pullet	4.2	164.1

*Application rate = 200 lbs./ acre $P_2 0_5$ $\prod$ P_2O_5 content
**N applied = application rate x N content

Table 1: Averages over all counties by litter type.*

	lbs./ton (as is)				
	n=379		*n=390*		
	Moisture (%)	*Calcium*	*Nitrogen*	*P_2O_5*	*K_2O*
Broiler	22.8^{b} +/- 0.46	48.5^{b} +/- 0.97	59.3^{a} +/- 0.63	59.4^{b} +/- 0.87	51.5^{a} +/- 0.50
Broiler Breeder	36.0^{a} +/- 1.13	125.0^{a} +/- 2.40	39.8^{b} +/- 1.57	61.7^{b} +/- 2.19	39.6^{b} +/-1.26
Pullet	23.4^{b} +/- 2.71	37.8^{b} +/- 5.77	37.9^{b} +/- 3.78	46.2^{a} +/- 5.26	37.5^{b} +/- 3.02

^{ab} means with no similar superscript are significantly different ($p<.05$)
* +/- = standard error of the mean

Table 2: Broiler litter nutrient content comparisons between counties*

	lbs./ton (as is)				
	n=318		*n=329*		
	Moisture (%)	*Calcium*	*Nitrogen*	*P_2O_5*	*K_2O*
Adair	22.4^{c} +/- 1.07	48.5^{bc} +/- 1.82	57.8^{bc} +/- 1.83	67.0^{ab} +/- 2.14	51.6^{b} +/- 1.50
Craig	13.3^{d} +/- 3.0	58.0^{a} +/- 3.16	52.7^{c} +/- 3.16	65.1^{abc} +/- 3.70	52.7^{b} +/-2.60
Delaware	22.9^{bc} +/- 0.54	48.1^{c} +/- 0.92	64.8^{a} +/- 0.92	63.2^{bc} +/- 1.07	50.2^{b} +/-0.76
Haskell	20.7^{bc} +/- 1.85	42.7^{c} +/- 3.16	58.2^{abc} +/- 2.12	31.3^{e} +/- 2.48	41.3^{c} +/-1.75
LeFlore	25.1^{a} +/- 0.60	46.1^{c} +/- 1.03	57.0^{bc} +/- 1.03	48.9^{d} +/- 1.20	49.5^{b} +/-0.85
Mayes	24.8^{ab} +/- 1.60	48.5^{bc} +/- 2.73	52.2^{c} +/- 2.74	62.7^{bc} +/- 3.20	50.8^{b} +/- 2.26
McCurtain	21.8^{bc} +/- 0.68	51.9^{ab} +/- 1.17	56.5^{bc} +/- 1.17	71.4^{a} +/- 1.37	59.1^{a} +/- 0.96
Ottawa	23.0^{abc} +/- 3.21	41.2^{c} +/- 5.47	67.1^{ab} +/- 5.48	51.7^{cd} +/- 6.41	49.5^{bc} +/- 4.51

*means shown +/- standard error of mean
^{abcde} means within a column with no similar superscript are significantly different ($P<.05$)

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