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POULTRY WASTES AS FEED FOR RUMINANTS: II EFFECT OF AGE ON CHEMICAL COMPOSITION OF BROILER LITTER AND CAGED LAYER DROPPINGS

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The chemical composition of caged layer droppings, on a dry matter basis, did not show significant variation as accumulation progressed. However, moisture content increased significantly with time. The chemical composition of wood shaving broiler litter in occupied broiler houses, on the other hand, showed significant variation with age. Some chemical constituents such as moisture, crude protein, ash and uric acid nitrogen, increased with age. A greater proportion of the observed variation in the chemical composition of broiler litter was due to dilution effect of the manure on the wood bedding material.

Key words: poultry, droppings, litter, age, chemical composition

The rapid growth of the poultry industry in many parts of the world has resulted in the production of large quantities of poultry wastes. There are two types of poultry wastes, viz, poultry droppings alone (manure) and poultry droppings mixed with the bedding material (poultry litter). For many decades, poultry wastes have been used as soil amendment, particularly for crops that respond to liberal application of nitrogen, phosphorus and potassium (Perkins and Parker 1971); but its potential as a feed supplement for ruminant animals has only been investigated in recent years (Bhattacharya and Fontenot 1966; Brugman et al 1964; Leibholz 1969; Lowman and Knight 1970; El-Sabban et al 1970; Flipot et al 1975). Poultry waste is a salvage material whose chemical composition is affected by many factors.

The objective of this experiment was to study the effect of age on the chemical composition of wood shaving broiler litter and caged layer droppings.

Materials and Methods

Samples of poultry litter were collected from broiler houses of the University Farm on days 14, 28 and 42 after the birds were put into the new wood shaving bedding material. A minimum of 30 samples were collected from each of the three broiler houses, using a 3.5 cm diameter steel pipe to ensure uniform collection of material from the top to the bottom of the litter. All collections were placed together in a 4 litre bucket, mixed thoroughly and sub-sampled for chemical analysis. Samples of poultry droppings were similarly collected from three caged layer houses. At the start of the experimental period, the previously accumulated manure was cleaned out. Samples were then collected on days 14, 28 and 42 after the cleaning out.

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At each sampling date, moisture was determined from the fresh materials (litter or manure) by drying 2 g of the material in a vacuum oven at 85°C for 24 hours. Crude protein content (N x 6.25) was also determined from 1 g fresh material according to the A.O.A.C. (1970) method. The remaining fresh material was then dried in a forced-air oven at 80°C for 72h, ground and stored for the determination of other chemical components at a later date. Ash, crude fibre, ether extract and nitrogen-free extract(NFE) were determined using the ground samples by the A.O.A.C. (1970) methods. Uric acid nitrogen was determined from 10 g oven-dry samples by the spectrophotometric procedure reported by Buys and Potgieter (1959). Statistical analyses were computed using the analysis of variance (Steel and Torrie 1960) while significance between treatment means was determined by Duncans' (1955) multiple range test.

Results and Discussion

The chemical composition of broiler litter and caged layer droppings as affected by age are presented in Tables 1 and 2 respectively. The moisture content of both the litter and the droppings increased significantly ($P < 0.05$) with age. This situation could be explained by the fact that the production of droppings on the wood shaving material in the broiler house and that of pure droppings in the caged layer house was at a faster rate than its drying process. The droppings from the caged layers contained a higher moisture content than the litter from the broiler house at all sampling dates due to the dilution effect of the dry wood shavings. The moisture content of poultry wastes could be important depending on the nature of feed supplement that is required. With most dry concentrate feeds the poultry waste is used in the dry form (Bhattacharya and Fontenot 1966) while the fresh material is preferred when used with silages or other succulent feeds (Meyreles and Preston 1982).

The mean crude protein (N x 6.25) of broiler litter increased significantly ($P < 0.05$) with age, increasing from 16.3% at 14 days to 26.4% at 42 days. This progressive increase was mainly due to the increasing ratio of manure to the wood shaving bedding material. However, the mean crude protein content of caged layer droppings did not show any significant ($P > 0.05$) differences with age. The slight decrease in crude protein content as age progressed could be due to loss of nitrogen as ammonia (Alexander et al 1968). But in the case of the litter, the slight loss of nitrogen as ammonia was overshadowed by the increase in the ratio of manure to the wood shaving material. The uric acid nitrogen of the litter similarly increased significantly ($P < 0.05$) with age, but when calculated as a percentage of total nitrogen was more or less constant, and accounted for approximately 1/3 of the total nitrogen in the litter. The uric acid nitrogen of the caged layer droppings did not show any significant($P > 0.05$) differences, and it accounted for slightly less than half (41.9 - 43.1 %) of the total nitrogen in the droppings.

The mean ether extract values for the broiler litter decreased significantly ($P < 0.05$) with age. But those for the caged layer droppings did not show any significant ($P > 0.05$) variation. The mean crude fibre content of the broiler litter also decreased significantly ($P < 0.05$) with age. This was due to the increasing ratio of manure to the wood shaving material. In the case of caged layer droppings, the crude fibre values

Table 1:

Chemical composition of wood shaving broiler litter as affected by age ($\bar{x}$ ± SE)

Composition	Day of sample		
	14	28	42
Moisture content (%)	19.9 ± 3.8[c]	25.8 ± 5.1[b]	33.6 ± 7.4[a]
Other components (DM basis)			
Crude protein (%)	16.3 ± 1.9[c]	22.7 ± 2.3[b]	26.4 ± 4.2[a]
Ether extract (%)	2.6 ± 0.6[a]	2.1 ± 0.8[b]	1.9 ± 0.5[b]
Crude fibre (%)	26.1 ± 3.4[a]	20.6 ± 2.9[b]	16.6 ± 2.3[c]
Ash (%)	10.7 ± 1.8[c]	15.9 ± 4.7[b]	18.2 ± 6.4[a]
NFE (%)	44.7 ± 3.2[a]	39.7 ± 5.8[b]	36.9 ± 6.1[c]
Uric acid - N (mg/g)	8.7 ± 1.2[c]	12.7 ± 1.4[b]	14.4 ± 1.3[a]
Uric acid - N as % of total - N	33.3	35.0	34.1

[a,b,c] Means having different superscripts on the same line are significantly different ($P < 0.05$)

Table 2:

Chemical composition of caged layer droppings as affected by age ($\bar{x}$ ± SE)

Composition	Day of sample		
	14	28	42
Moisture content (%)	38.3 ± 2.7[c]	43.8 ± 0.9[b]	49.5 ± 3.6[a]
Other components (DM basis)			
Crude protein (%)	34.2 ± 1.1	32.6 ± 0.9	31.8 ± 0.9
Ether extract (%)	1.2 ± 0.6	1.0 ± 0.3	0.8 ± 0.4
Crude fibre (%)	10.1 ± 0.4	9.6 ± 0.6	9.1 ± 0.6
Ash (%)	24.5 ± 2.6	26.9 ± 2.4	28.9 ± 3.1
NFE (%)	30.0 ± 1.1	29.9 ± 2.7	29.4 ± 2.4
Uric acid - N (mg/g)	22.9 ± 0.6	22.5 ± 0.5	21.4 ± 0.6
Uric acid - N as % of Total - N	41.9	43.1	42.0

[a,b,c] Means having different superscripts on the same line are significantly different ($P < 0.05$)

decreased slightly but not significantly with age. The presence of wood shavings in the litter accounted for the higher crude fibre values in the litter when compared with the pure droppings.

The mean ash content of the broiler litter increased significantly ($P < 0.05$) with age. This was mainly due to the increasing ratio of manure to the wood shaving bedding material as age progressed. The mean ash content of the caged layer droppings increased slightly but not significantly as age progressed. The ash values in the litter were lower than those in the caged layer droppings. This difference could be explained by the dilution of the manure in the litter by the wood shaving bedding material.

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