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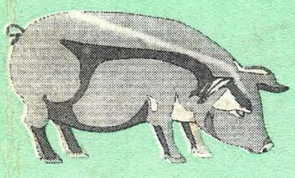

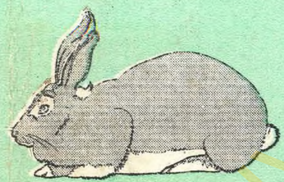

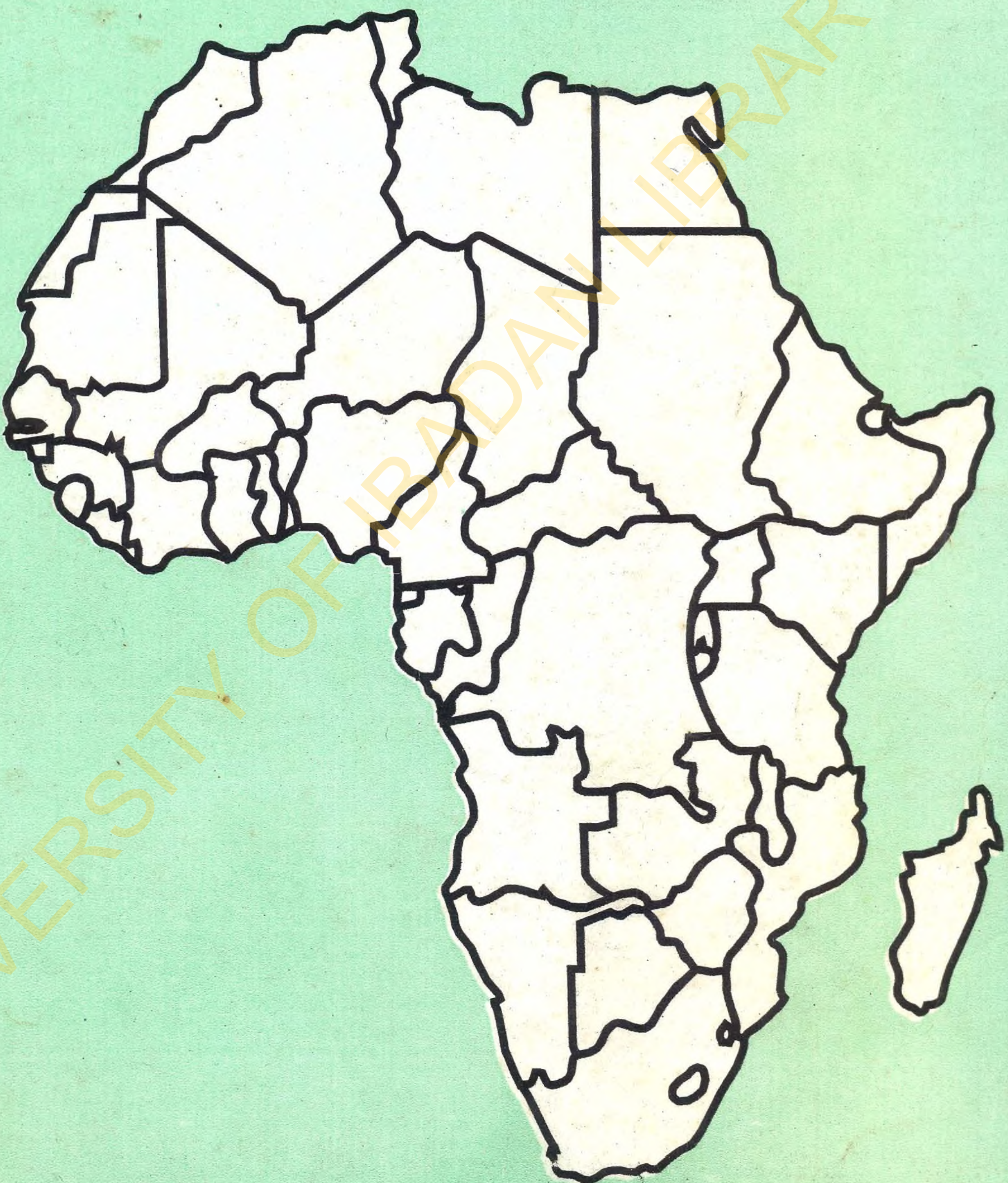

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QUALITIES OF BROILER LITTER IN RUMINANT FEEDING

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ABSTRACT

Feed represent a major proportion of the overall production cost in the livestock industry. Availability of good quality and unadulterated conventional feed all year round is a major constraint in livestock production. Also, competition for the same feed resources existing between humans and animals have further compounded the problem leading to overpricing of animal products. Poultry wastes, if properly processed represent a vast reservoir of cheap nutrients especially for ruminants. This study was designed to evaluate broiler litter as a feed for ruminant diets.

One hundred and twenty (120) broiler chicks were randomly distributed into three treatments of forty birds each. The birds were fed diets containing 25% crude protein and 23% crude protein at the starter and finisher phases. Litter collected on days 35, 42 and 49 after stocking were sun dried and subjected to proximate analysis to determine crude protein (CP), neutral detergent fibre (NDF) and acid detergent fibre (ADF).

The CP, NDF and ADF were: 22.5%, 25.5% and 23.5% for CP, 40.5%, 38.2% and 39.3% for NDF and 21.4%, 20.3% and 20.8% for ADF respectively. However, there were no significant differences (P< 0.05) in the CP and ADF values for the 3 stages of collection.

Broiler litter has high protein level which will be efficiently utilized to promote optimum weight gain in ruminants.
Keywords: Poultry wastes, Broiler litter, Ruminant.

INTRODUCTION.

The aim of any livestock production enterprise is to supply food in form of animal protein to meet the requirement of the ever – growing human population. This goal can be achieved by using the cheapest available feedstuff to supply the nutrient required by the animals so as to maximize profit. Livestock farmers choose which of the feeds to use for each group of animals throughout the year and which supplements to buy. These decisions depend on the nutritional value and availability of each feed resource as influenced by the time of the year and where there is drought or plenty and on the myriads of socio- economic factors, which affect feed prices, ultimately affecting the efficiency of production systems.

The potentials of local feed sources for animal diets need to be investigated so also are the expansion of the raw material base. Local cheap sources of have to be found to replace the expensive imported feed supplements (ILCA, 1976).

Animal wastes represent a vast reservoir of cheap nutrients, particularly for ruminants. Waste from poultry is easily collectable, as it is concentrated in small areas, and its cost as a raw material for feed is generally the cost of transport alone. Feeding of animal wastes results in reduced feed cost, lowered price of animal products and contributes to self – sufficiency in protein, phosphorous and other expensive nutrients in the ruminants ration (FAO, 1980).

The use of broiler litter as feed in ruminant diets is still limited in this part of the world, due to variations in its components and the ignorance of some livestock producers as regards the potentials of broiler litter in fattening ruminants thereby reducing the cost of production. In addition, it creates a useful way of disposing broiler litter, which would have otherwise been a nuisance to the farmer in terms of difficulty of its disposal, its potential to cause disease outbreaks and its pollution of the environment.

In view of variations in the composition of nutrients in broiler litter, this study was conducted to evaluate the nutrient composition of broiler litter as affected by the length of time (days) the birds spent on the litter.

MATERIALS AND METHODS

One hundred and twenty (120) broiler chicks were randomly distributed into three treatments of forty birds each. Each treatment group was replicated four times with ten birds each. There was intra-ocular administration of Newcastle vaccine at day old. On the day 14, the birds were given Infectious Bursa Disease vaccine orally. Furthermore, on the day 28, Lasota vaccine (another variant of Newcastle Disease vaccine) was administered through water.

Right from day-old, the birds were given an antibiotics called Floxatril (enrofloxacin as the active ingredient), Vitalyte (an antistress) and glucose in water for the first few days of life. Thereafter, coccidiostats were administered promptly to prevent the attack of coccidiosis. . The birds were fed isocaloric and isonitrogenous starter diets containing 25% crude protein for the first four weeks. A finisher diet containing 23% crude protein was given from week five. The ingredient composition of the starter and finisher diets is given in Table 1.

Table 1: Gross composition (%) of starter and finisher diets.

Ingredient	Starter	Finisher
Maize	50	55
Soya bean	34	30
Groundnut cake	10	9.5
Fish meal	2.5	2.0
Bone meal	1.0	1.0
Oyster shell	2.0	2.0
*Premix	0.25	0.25
Salt	0.25	0.25
Methionine	0.01	_
Calculated		
Crude protein (%)	25.5	23.5
Energy (ME Kcal/kg)	2970.5	3000.00

- Vitamin-Mineral Premix (Agricare – Mix, Pfizer Production Plc, Lagos, Nigeria) contained per 1000g: Vitamin A, 12,000,000 IU; Vitamin D3 2,000,000 IU; Vitamin E 7,000 IU; Vitamin B2 4,000 mg; Nicotinic acid 15,000 mg; Calcium d-pentothenate 8,000 mg; Biotin 40 mg; Vitamin B12 10 mg; Mn 20,000 mg; Fe 50,000 mg; Zn 100,000 mg; 100,000 mg; Cu 10,000 mg; Iodine 750; Co 3000 mg.

Collection of samples.

Sample collection was done on the days 35, 42 and 49 after stocking. At the beginning of every new week from day 35, the litters of four replicates were taken by dividing each pen into nine sections and samples were collected from each of the sections. These samples were bulked together to get a representative sample of each pen. This procedure was repeated for each of the pens for the days 42 and 49.

About 30g sub-sample was taken out of the lot for proximate analysis according to (AOAC, 1990). The components of the proximate analysis were: crude protein, ether extract, ash, moisture, neutral detergent fibre (NDF) and acid detergent fibre (ADF).

In addition, a known weight of thoroughly mixed sample was weighed into a foil paper of known weight. The contents of the foil paper were then dried in an oven for 24 hours at temperature of 100°C to constant weight. After oven drying, it was cooled in a desiccator and final weight was taken for the determination of minerals.

Mineral analysis.

0.5 g each of the dried samples were weighed and transferred into micro – digestion tubes (75 ml). 4 ml of concentrated Sulphuric acid (H_2SO_4) and 2 ml of Hydrogen Peroxide (H_2O_2) were added. The H_2O_2 was added carefully as reaction could be vigorous. The tubes were heated in a block digester (preheated to 270°C) for 30 minutes; they were then taken out and cooled.

Another portion of H_2O_2 (2 ml) was added and the heating continued until digestion was completed. The digest was made up to volume with distilled water; it was thoroughly shaken and left to settle for a few hours.

Analysis for the Calcium was performed by diluting the digest 20 times with 0.1 % Lanthanum. The remaining elements (Copper, Phosphorous and Manganese) were read directly from digested volume (75 ml) with Atomic Absorption Spectrophotometer (AAS).

Statistical analysis

All the parameters were subjected to statistical analysis using SAS (1999), where statistical significance was observed, means were compared. (Duncan, 1955) Multiple Range test of the same package was used to determine the significant differences between the means.

RESULTS AND DISCUSSION

The chemical composition of broiler litter samples is summarized in Table 2.

Table 2: Chemical Composition (g /100g DM) of Broiler litter

Nutrient	Treatment (Age in days)		
	35^{th}	42^{nd}	49^{th}
Dry matter (%)	81.1 ± 2.2	86.0 ± 2.0	84.1 ± 1.9
Crude Protein (%)	22.5 ± 1.3	25.4 ± 0.9	23.5 ± 0.2
Fat (%)	2.5 ± 0.0^{b}	2.5 ± 0.1^{b}	2.8 ± 0.1^{a}
Ash (%)	21.5 ± 0.4^{a}	18.6 ± 0.2^{b}	21.5 ± 0.8
ADF (%)	21.4 ± 0.4	20.3 ± 0.2	20.8 ± 0.4
NDF (%)	40.5 ± 0.5	38.2 ± 0.1	39.3 ± 0.5

a, b: means within the same row with different superscripts are significantly different.

The dry matter increased from 81.1% at day 35 to 86.0% at day 42 but declined to 84.1% at day 49. The variations were not however significant (P>0.05). In a study carried out in Alabama, USA, Jacob *et al.*, (1997) obtained an average of 85 % dry matter and a range of 61- 95 % DM as suitable for inclusion in diets of ruminant. In addition, they reported that the moisture content of the litter influences the physical quality of the feed. For ease of processing and feeding, moisture in the broiler litter should range between 12 and 25 %.

In this study, the mean crude protein values varied from 22.5 % at day 35 to 25.4% at day 42, but, declined to 23.5% at day 49. The variations were not significantly different (P>0.05). The values obtained for crude protein were in agreement with the values of 25.3% and 25.5% of Blair (1975) and FAO (1980) respectively, but lower than the value of 31.3% reported by Bhattacharya and Taylor (1975). Also, the values obtained in this study were greater than 24.9% obtained by Jacob *et al.*, (1997). In addition, Henning and Poppe (1977) obtained 40.0% CP for days 28 to 35 and 43.5% for 49 to 56. This showed that CP of litter increases significantly with the length of days. This wide range in values of CP could be due to differences in the amount of feed spillage, the quantity and type of bedding material used and stocking density. The three stages of this study did not have an appreciable effect on CP values (P>0.05), therefore, broiler litter can be incorporated into the diets of ruminants as a protein source from day 35 of litter collection. Also, the nitrogen of broiler litter is present largely as uric acid: this is converted to ammonia relatively slowly, allowing a greater proportion to be converted to microbial protein, than from urea (McDonald *et al,* 1988).

The mean EE content of the litter increased slightly over the sampling period. The values ranged from 2.5% to 2.8%. Apparent differences (P<0.05) were observed between the EE values of birds kept on the litter for days 35 to 42 and 49. The values obtained in this study were in agreement with the 2.7 % reported by FAO (1980) and 2.5% by Adeleye (1972).

The mean ash content of the broiler litter decreased from days 35 to 42 with values of 21.5% and 18.6% respectively but increased to 21.5% for day 49. It is note worthy that the value at day 49 is comparable to the value at day 35. Statistical analysis showed that there was no significant difference (P>0.05) between the ash content of the litter collected on days 35 and 49, but, there was an apparent variation between the values obtained on day 42 and those of days 35 and 49. These values agreed with 21.9% obtained by Muller (1978) and 18.9% obtained by Adeleye, (1972). They recommended ash levels of between 15% and 25% in broiler litter. Also, they reported that litter containing ash levels of more than 25 % should not be fed to ruminants. From the result, the values obtained over the sampling period are still within the safe limits recommended for ruminants (15–25%), the litter can be used at any of these periods.

The acid detergent fibre values show a decrease from day 35 to 42 and then a slight increase in day 49 with values of 21.4%, 20.3% and 20.8% respectively. There were no significant differences (P>0.05) between these values.

The mean values for the neutral detergent fibre were 40.5%, 38.2% and 39.3% for days 35, 42 and 49 respectively. There were no significant difference between the values obtained for days 35 and 49 and days 42 and 49 day but significant differences (P < 0.05) were obtained between days 35 and 42.

The values obtained by Maviembela *et al.*, (1997) were 20 -35% for ADF and 30 – 50% for NDF respectively are similar to the present findings.

The mean values obtained for Calcium, Manganese, Phosphorous and Copper levels in broiler litter were presented in Table 3.

Table 3: Mean values for Ca, P, Cu and Mn in broiler litter

Variable (%)	Diet only	Bedding material only	Litter Day 35	Litter Day 42	Litter Day 49
Ca	1.2 ± 0.0	0.2± 0.0	1.8 ± 0.0	2.4 ± 0.1	3.2 ± 0.3
P	0.8 ± 0.0	0.0± 0.0	1.0 ± 0.1	1.2 ± 0.1	1.5 ± 0.2
Cu	0.1 ± 0.0	0.0± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0
Mn	0.1 ± 0.0	0.0± 0.0	-	0.1 ± 0.0	0.1 ± 0.0

From Table 3, the mean values for Calcium on days 35, 42 and 49 were 1.8%, 2.4% and 3.2% respectively. Blair (1975) and Bhattacharya and Taylor (1975) obtained a range of values between 1.3% and 2.5%. There were no significant differences (P> 0.05) between the values at the days of collection.

The mean values obtained for Phosphorous on days 35, 42 and 49 ranged from 1.0% to 1.5%. However, these values were in agreement to the values of Blair (1975). He obtained 0.9% to 1.8%. Significant differences (P > 0.05) were not observed between the collection days. The Phosphorous level in broiler litter was similar to the trend observed for Calcium which varied with its level in the diet. It was observed that the high amount of Phosphorous in the diet depended on its availability and the nature of grit available to the birds.

Furthermore, the mean values obtained for Manganese were the same for days 42 and 49 with nothing observed for day 35. There were no significant differences observed between the values at the days of collection. Muller (1980) observed that this low value could be due to the lesser amount of Mn voided on the bedding material. Also, this could be adduced to the fact that the Mn in the feed was actually low.

Similarly, the mean values obtained for Copper at days 35, 42 and 49 were the same for all the days of collection. There were no significant differences ($P > 0.05$) between the values obtained.

Generally, the level of Calcium obtained was higher at any particular day of collection than other element in the litter. Perkins and Parker (1971) stated that Ca constitute the major macro – element ranging between 1.2 and 3.8% of broiler litter.

Broiler litter is an excellent source of the major and trace minerals needed in the diet of ruminants. High Calcium levels, in the presence of an imbalance of other minerals, can cause milk fever in beef cows at calving (Jacob *et al,* 1997).

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