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Effect of Replacing Oyster Shell with Gypsum in Broiler Finisher Diet

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Abstract: The study was conducted to determine the effect of replacing oyster shell with gypsum. A total of 90 Anak 2000 broilers of 4 weeks of mean weight 757.3 ± 25g were divided into 3 dietary treatments (T_1, T_2, T_3) in which oyster shell fraction of the finisher diet was replaced at 0% (T_1), 50% (T_2) and 100% (T_3) with gypsum. Completely Randomized Design was used for the trial and each treatment was replicated thrice with 10 chickens per replicate. The results show that the feed intake, weight gain and efficiency of feed utilization were not significantly ($P>0.05$) affected by the dietary treatments. Moreover, dressing percent, liver and heart weight, packed cell volume and white blood cell counts of the test diets were not significantly different from the control diet. Conclusively, gypsum could serve as substitute for oyster shell without any detrimental effect.

Keywords: Gypsum, oyster shell, weight gain, dressing percent, white blood count, Nigeria.

INTRODUCTION

Poultry production is one of the lucrative farming business in Nigeria. The meat and egg which are the main products are well accepted and rich in protein[8]. The major limitation to the growth of the industry is high cost of feed ingredients which constitutes about 70% of the total cost[14]. Minerals source such as bone meal, oyster shell, limestone, calcium, phosphate and gypsum are important for bone formation and proper utilization of the feed[6,5]. Gypsum is a mineral element with chemical composition of $Caso_4.2H_2O$ and it is the commonest sulphate mineral used for dental and jewelry costing. It is used in cement industry as clinker and regulator, also in fabrication and formulation of building materials and agricultural soil and it is available in all cement industries areas[3,10]. Research has been conducted on the use of gypsum in Layers and snail diets as source of calcium[3,11]. There is paucity of information on the use of gypsum in broiler diet. This study was conducted to investigate the effect of gypsum as source of calcium as a replacement for oyster shell in broiler finisher diet.

MATERIALS AND METHODS

The experiment was conducted at the Poultry Unit of Federal College of Animal Health and Production of the Institute of Agricultural Research and Training, Moor Plantation, Ibadan. Gypsum was obtained from Ewekoro Cement Company in Ogun State, Nigeria. The gypsum collected was oven dried to a constant weight in the oven to remove water molecular. A total of ninety Anak 2000 birds of 4 weeks old with mean weight of 757.3 ± 25g were randomly selected and weighed. The birds were distributed into three equal groups and were assigned to three dietary treatments (T_1, T_2 and T_3). Diet 1(T_1) was formulated to contain 0% gypsum, while diet 2 (T_2) and diet 3 (T_3) were formulated to contain 50% and 100% gypsum as replacement for oyster shell respectively in broiler finisher diet (Table 1). Completely randomized design was used for the study. Each dietary treatment was replicated thrice with 10 birds per replicate. The diets were Isonitrogenous and Isocaloric of 20% Crude Protein and Energy of 3.0 KcalME/g. The detail of the experimental composition is shown in Table 1. All the medications and other routine management practices for efficient broiler's production were observed. Parameters measured were feed intake and weight gain on daily and weekly basis respectively. Feed and water were given *ad-libitum.* Feed conversion ratio, feed cost and cost per weight gain were calculated. At the end of five weeks, blood sample were collected from the jugular vein of 4 birds per replicate into a set of sterilized glass tubes containing ethylene diamine tetra acetic acid (EDTA) for determination of

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Table 1: Gross composition of the experimental diets (%)

Ingredients	Ingredients cost (N)	T_1 (0 % Gypsum)	T_2 (50% Gypsum)	T_3 (100% Gypsum)
Maize	29	56	56	56
Soybean Meal	45	12.3	12.3	12.3
Wheat Bran	9	8	8	8
G. N. C.	30	14	14	14
Fish Meal	120	2	2	2
Bone Meal	20	2	2	2
Oyster Shell	5	5	2.5	0
Gypsum	1	0	2.5	5.0
Lysine	600	0.1	0.1	0.1
Methionine	550	0.1	0.1	0.1
Nacl	20	0.25	0.25	0.25
Premix	280	0.25	0.25	0.25
Total		100	100	100
Cost/kg (N)		33.85	31.55	31.45

Table 2: Chemical composition of the experimental diets (% Dry matter basis).

	T_1	T_2	T_3
Dry Matter	95.6	94.8	95.18
Crude Protein	19.42	19.51	19.49
Crude Fibre	3.98	3.89	3.88
Ether Extract	6.48	6.46	6.50
Ash	7.43	7.40	7.36
Nitrogen Free Extract	62.69	62.74	62.77
Calcium	1.04	1.03	1.03
Phosphorus	0.82	0.82	0.82

haematological parameters (Packed cell volume (PCV) White blood cell (WBC) and Red blood cell count (RBC)[9]. The carcass analysis was done at the end of five weeks. Six broilers were randomly selected from each treatment. The birds were starved overnight, weighed and slaughtered. The feather was removed by scalding. The lung, heart, head, gizzard and liver were removed, weighed separately and dressing percentage was calculated. Chemical composition of the experimental diets was carried out according to the method of A.O.A.C.,[1] while the data were subjected to statistical analysis using analysis of variance technique with the help of computer package[12].

RESULTS AND DISCUSSION

The growth performance of broiler finisher fed varying levels of gypsum is shown in Table 3. The total feed intake and weight gain in the test diets 2 and 3 were relatively similar to that of control diet ($P>0.05$). The similarity in feed intake and weight gain could be as a result of Isonitrogenous and Isocaloric nature of the diets and the fact that oyster shell and gypsum are sources of calcium which aids metabolic activities and not principal nutrients for growth[5]. The results indicate that gypsum can replace oyster without any adverse effect on feed intake and weight gain. The weight gain and feed consumption agreed with the reports of other authors[8,2]. The efficiency of feed utilization of the test diets were not significantly different from that of control diet thus indicating that inclusion of gypsum in the diets did not affect the conversion of the feed to edible meat.

Considering the cost analysis of oyster shell being replaced with gypsum (Table 4), the cost per weight were relatively similar in all the treatments ($P>0.05$) although T_2 had the lowest figure. It implies that it is economical to

Table 3: Growth performance of broiler finisher fed varying levels of Gypsum.

Variable	T_1	T_2	T_3	± SEM
Initial weight (g/bird)	756.94[a]	758.34[a]	755.99[a]	26.15
Final weight (g/bird)	2107.15[a]	2111.54[a]	2114.01[a]	74.5
Total weight gain (g/bird)	1350.21[a]	1358.54[a]	1349.1[a]	41.05
Weekly weight gain (g/bird)	270.04[a]	271.71[a]	269.8[a]	11.05
Total feed intake (g)	3318.7[a]	3315.2[a]	3321.15[a]	76.14
Weekly feed intake	663.74	663.04	664.23[a]	20.3
Feed conversion ratio	2.46[a]	2.44[a]	2.46[a]	0.36
Mortality	3.33	3.33	0.00	

Means with the same superscripts along the same row are not significantly different (P > 0.05).

Table 4: Cost Analysis of broiler finisher fed experimental diets.

Variable	T_1	T_2	T_3	± SEM
Feed cost (kg)	33.85[a]	31.55[a]	31.45[a]	3.45
Total feed intake (kg)	3.32[a]	3.32[a]	3.32[a]	0.12
Total feed cost	112.38[a]	104.75[a]	104.41[a]	8.48
Total weight gain	1.35[a]	1.36[a]	1.35[a]	0.12
Cost/weight gain	83.24[a]	77.02[b]	77.34[b]	2.34

Means with the same superscripts along the same row are not significantly different (P > 0.05).

Table 5: Carcass analysis of broiler finisher fed experimental diets.

Variable	T_1	T_2	T_3	± SEM
Live weight (g)	2105.6[a]	2110.5[a]	2106.8[a]	50.6
Feather weight (g)	124.2[a]	125.15[a]	124.9[a]	5.87
Eviscerated weight (g)	1583.4[a]	1580.77[a]	1581.15[a]	41.8
Dressing percent (g)	75.2[a]	74.9[a]	75.05[a]	4.56
Heart weight (g)	12.8[a]	12.74[a]	12.80[a]	1.98
Liver weight (g)	46.2[a]	45.93[a]	46.01[a]	3.42
Gizzard weight (g)	51.7[a]	51.36[a]	51.84[a]	3.90

Means with the same superscripts along the same row are not significantly different (P > 0.05).

Table 6: Effect of Gypsum on haematological indices of broiler finisher.

Variable	T_1	T_2	T_3	± SEM
P C V (%)	34.9[a]	34.45[a]	34.01[a]	3.95
R B C (x 10^6)	3.01[a]	3.15[a]	3.05[a]	0.45
W B C (x $10^3/mm^3$)	26.1[a]	26.8[a]	26.7[a]	1.99
Hb (g/100ml)	11.01[a]	10.98[a]	11.08[a]	2.11

Means with the same superscripts along the same row are not significantly different (P > 0.05).

use gypsum if oyster shell is costly or not available. The dressing percent of the broilers in all the treatments were not significantly different from one another (P>0.05) (Table 5). The values ranged between 74.9 and 75.2%. The heart and liver weight in the test diets were similar to that of control diet (P>0.05). Increase or decrease organ weight like lung, liver and heart could be an indication of disease, toxicity or response to various chemical[13,7,9] however increase or decrease in heart and liver weight were not noticed hence gypsum can replace oyster without any adverse effect on the aforementioned organs. The safety nature of gypsum was also confirmed by the haematology

study (Table 5). The PCV of T_2 and T_3 were relatively similar to that of control diet and the values fell within the recommended PCV for broiler finisher. Also, the RBC and WBC were not significantly affected by the dietary treatments as negative changes in haematology indices are indication or evidence of metabolic stress or toxicity[4].

In conclusion, the weight gain, efficiency of feed utilization, carcass analysis and the haematology indices of the broilers were not affected by substituting oyster shell with gypsum hence gypsum could replace oyster up to 100% without any adverse effect.

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