

BONE QUALITY AND BLOOD MINERAL COMPOSITION OF BROILER CHICKENS FED LEVELS OF EUBIOTIC COMBINATION

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ABSTRACT

A feeding trial was conducted to evaluate the response of broiler chickens fed diets containing eubiotic combinations on bone quality and blood mineral composition. A total of 510 day old Ross broiler chicks were allotted randomly to five dietary treatments each replicated thrice, with 34 chicks per replicate. The diet consisted of 0g of control diet, 9g Bacillus subtilis (BS) + 100g Essential oil (Eos), (9gBS+100gEos), 100g Essential oil (Eos) + 400g Organic acids (OA) (100g Eos+400g OA), 9g Bacillus subtilis(BS) + 400g Organic acids(OA) (9g BS+400g OA) for T1-T4 respectively while T5 had Oxytetracycline, an antibiotic growth promoter(AGP). Parameters collected were on tibia bone quality and blood mineral composition. All data were subjected to analysis of variance and significant differences among treatment means were compared using the Tukey test of significance. The result for bone quality showed that birds fed levels of eubiotic combination had significantly higher tibia bone ash than birds on control and AGPs. Eubiotic combinations increased bone strength, and absorption of blood minerals from the GIT. It was concluded that eubiotic combinations can be used as potential alternative to antibiotics in broiler chicken diet.

Keywords: Eubiotic combination, Antibiotic growth promoter, Blood minerals, Bone quality, Broiler chickens

INTRODUCTION

Healthy balance of micro-flora in the gastrointestinal tract is closely related with performance in broilers. This is of greatest interest among broiler producers because of its impact on economic profitability. The Increase in bacterial resistance to antibiotics in both humans and livestock has caused an increase in public and governmental interest in eliminating sub-therapeutic use of antibiotics in livestock as it raises concerns for food safety, environmental conservation and producing safer human foods from animal sources more efficiently and at lower cost. This has given impetus to continued search for new feed additives that would positively modulate the gut microbiota, increase rate of growth and reduce cost of production. (Barton,2000)

The alternatives to antibiotics being currently promoted are Eubiotics. 'Eubiosis' as used in the feed industry refers to a healthy balance of the microbiota in the gastrointestinal tract. The use of a single eubiotic product as an alternative to antibiotic growth promoters has been in practice, and studies has demonstrated its beneficial effects on improvement of growth performance (Yusrizal and Chen 2003; Rahmani and Speer 2005). However, recent research and development of eubiotics combination products have been increasingly focused on. A way of potentiating the efficacy of a single eubiotic preparations may be in its combination in a synergistic approach. This is of greatest interest among broiler producers because of its impact on economic profitability (Awad *et al.*, 2009). This study was therefore carried out to evaluate the effect of eubiotic combinations on tibia bone characteristics and blood minerals composition of broiler chickens.

MATERIALS AND METHODS

Experimental site

The experiment was conducted at the Poultry Unit of Animal Science Departmental Teaching and Research Farm, Ahmadu Bello University, Zaria, Kaduna State, Nigeria. Zaria is located in the Northern Guinea Savannah ecological zone on longitude 11° 09 ' 01.78 ' N and latitude 7° 39 ' 14.79 ' E, 671m above sea level. The climate is characterized by a well-defined dry and wet seasons and relatively dry with annual rainfall ranging from 700-1400mm.

Experimental Design and management of birds

Five hundred and ten (510) day-old Ross broiler chicks were allocated to five (5) dietary treatments, each replicated three times with 34 chicks per replicate each in a completely randomized design (CRD). The birds were housed in deep litter pens and managed with all necessary routine management practices and routine vaccinations

Experimental diets

Five diets were formulated for the feeding trial to meet standard requirements of broiler chickens. Eubiotic combination were added as non-inclusive part of the diets.

Five diets were formulated as shown below.

Diet 1: 0 g of Eubiotic combination (Control)

Diet 2: Combination of *Bacillus subtilis* (9g) and Essential oils (100g)/100 Kg diet

Diet 3: Combination of Essential oils (100g) and Organic acid (400g)/100 Kg diet

Diet 4: Combination of *Bacillus subtilis* (9g) and Organic (400g) /100 Kg diet

Diet 5: Oxytetracycline at 60g/100Kg diet (as recommended by manufacturer).

Bone Quality determination

The tibia bones of the birds used for the carcass analysis were removed carefully. They were weighed in grammes using a top loading digital scale to obtain fresh weight of bones. The length of the tibia bones was measured in cm using a graduated ruler. The fresh bones were oven dried at 100 °C until a constant weight was obtained. The dry bones were ashed at 550 °C in a muffle furnace for 6 hours to obtain the percent ash content of the bone. The bone ash was analysed for percent calcium, and magnesium content using Atomic Absorption Spectrophotometry (AAS), while phosphorus content using flame photometry. Bone density was calculated as bone weight/bone length A.O.A.C (2005)

Blood mineral composition assay

At the end of the finisher phase, calcium, phosphorous and magnesium were measured in the blood using three birds per treatment. Calcium, phosphorus and Magnesium were determined using the methods of Gindler and King (1972) and Goodwin (1970) respectively. This was carried out at Clinical Pathology laboratory of the Ahmadu Bello University Teaching Hospital, Zaria.

Statistical Analysis:

All data obtained from the three experiments were each statistically analysed using the General Linear Model Procedure of Statistical Analysis Systems and Significant difference between treatment means were separated using tukeyTest (SAS, 2002).

RESULTS AND DISCUSSION

Tibia bone Characteristics of broiler chickens fed levels of Eubiotic combination

The result of tibia bone characteristics of broiler chickens fed levels of Eubiotic combination (Table 1). There was significance ($P < 0.05$) difference was observed for Tibia bone ash. Birds fed levels of eubiotic combination had significantly high tibia bone ash than birds on control and AGPs. However, all other parameters measured though not significant was numerically higher for birds fed levels eubiotic combination. The higher values for bone density, bone dry matter and bone ash observed for the birds fed levels of eubiotic combination show that the combination of these materials increased bone strength of the birds. In an experiment with quails, short chain fatty acid improved both the absorption of dietary phosphorus and tibia bone mineralization (Sacakliet *et al.*, 2006)

Table 1: Tibia bone analysis of broiler chickens fed Eubiotic combination

Parameter	Eubiotic combinations					SEM
	Control	9g BS + 100g EOs	100g EOs+ 400g OA	9g BS + 400g OA	Oxytet	
Bone length (cm)	8.93	8.73	9.40	9.10	8.93	0.26
Bone weight (g)	16.67	16.67	18.33	17.67	15.00	1.49
Bone density (g/cm)	1.86	1.93	1.95	1.94	1.68	0.17
Bone dry matter (%)	41.76	43.36	43.21	43.89	42.99	1.14
Bone ash (%)	29.62 ^b	34.16 ^a	31.37 ^a	32.86 ^a	29.93 ^b	1.64

a,b Means with different superscripts on the same row are significantly different ($P < 0.05$)

BS=*Bacillus subtilis* Eos=Essential oils, OA=Organic acids, Oxytet=oxytetracycline

SEM= Standard error of mean.

Blood Mineral composition of broiler chickens fed levels Eubiotic combinations

Table 2 shows the blood mineral composition of broiler chickens fed levels of eubiotic combinations. Significant ($P < 0.05$) differences were observed for magnesium and phosphorous. Birds fed levels of eubiotic combination had significantly ($P < 0.05$) higher phosphorous and magnesium. Serum Calcium was also higher for birds fed eubiotic combinations though not significant. The result is indicative that eubiotic increases the absorption of blood minerals from the GIT. Lala *et al.*, (2016) reported increase of Ca and P levels in blood serum when they fed humic acid to broilers and attributed it to the lowering of gastrointestinal tract pH by using this acid, which increases the absorption of the minerals from the gut into the blood stream. Improvement in the utilization of calcium and phosphorus by organic acids supplementation was reported by Boling *et al.* (2001). Also, Abdo and Zeinb (2004) observed an increase in blood calcium of broiler chicks fed on dietary acidifier.

Table 2: Blood minerals composition of broiler chickens fed Eubiotic combination

Eubiotic combinations						
Parameter	Control	9gBS + 100g EOs	100g EOs+ 400gOA	9g BS + 400g OA	Oxytet	SEM
Calcium (mg/dl)	5.47	6.42	6.42	6.78	5.37	3.50
Magnesium (mg/dl)	1.78 ^b	2.35 ^a	2.26 ^a	2.40 ^a	2.10 ^b	2.21
Phosphorus (mg/dl)	2.57 ^b	3.37 ^a	3.21 ^a	3.45 ^a	2.42 ^b	3.20

a,b, ; Means with different superscripts on the same row are significantly different (P<0.05):

BS=*Bacillus subtilis*, Eos= Essential oils, OA=Organic acids, Oxytet=oxytetracycline

SEM: Standard error of mean

CONCLUSIONS AND APPLICATION

From the results obtained, the following conclusions were made:

1. Combined levels of *Bacillus subtilis* + Essential oil and *Bacillus subtilis* + Organic acids, improved bone strength and increased the absorption of minerals from the GIT.
2. Combined levels of *Bacillus subtilis* + Essential oil and *Bacillus subtilis* + Organic acids can potentially replace antibiotic growth promoters-AGP.

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