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Effects of Bone Ash, Rock Phosphate and Di Calcium Phosphate on Carcass Characteristics and Organoleptic Properties of Broiler Chickens

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Abstracts
This research was conducted to investigate the utilization of rock phosphate as an alternative phosphorus source to bone meal and dicalcium phosphate in broiler diet. The attempt was to put to use locally available sources of phosphorus in poultry production. A total of 250 Sayed broiler chicks were purchased at day old and brooded. After brooding, 210 very active and health ychicks were allotted at random to 3 dietary treatments, each with 5 replicates such that 14 birds were assigned to each replicate and a total of 70 birds made up a treatment. Data collected were analyzed using SPSS statistical software. The result had significant($P < 0.05$) differences on drumsticks, neck, wings, thighs and no significant ($P > 0.05$) differences across treatments for all internal organs examined. This study showed that, at 2.5 Kg per 100 Kg diet, rock phosphate can be utilized without adverse effect on carcass and internal organs characteristics. This also means that diet containing rock phosphate can compete favourably with bone ash which serve as a control and therefore safe for broiler chickens production. From this finding, it was recommended that, rock phosphate could be utilized without adverse effect on carcass and internal organs of broiler chickens.

Keywords: Calcium, broilers, internal organs, phosphorus sources, raw rock phosphate.

Introduction

The important minerals that are always considered in livestock rations are calcium (Ca) and phosphorus (P). Calcium sources in the country have been identified to include oyster shell, periwinkle shell, limestone and bone meal. Bone meal is valued mostly for its phosphorus content since Ca can be utilized from limestone which is often cheaper (Tion *et al*., 2012). Tion *et al.* (2012) also stated that when consumers of monogastric animal meat become aware of the inherent danger that may arise from eating meat of animals that are fed diets containing bone meal, they may shy away from such meat consumption as is the case of cholesterol stigma in fatty meats and eggs. Therefore, alternative sources of phosphorus should be found aside from bone meal.

The objective of this study is to evaluate the effect ofdifferent sources of phosphorus on carcass and internal organs of broiler finisher chickens.

Materials and Methods

The experiment was carried out at Divisional Veterinary Complex, in North Bank, Makurdi, Benue State. Makurdi is located between latitude 7.68 ^{0} North and Longitude 8.62 ^{0} East, the flood plain between 106 m to 113 m above sea level. The area is warm with a minimum temperature range of 17.3 ^{0} C to 24.5 ^{0} C and maximum temperature range of 29.8 ^{0} C to 35.6 ^{0} C. (Wikipedia, 2013).

The broiler chicks for the experiment were sourced from a reputable poultry dealer in Makurdi, Benue State. A total of 250 Sayed broiler chicks were purchased and brooded using conventional brooding method. After brooding, 210 very active and healthy chicks were selected for the experiment. Chicks were allotted at random in a Completely Randomized Design (CRD) to 3 dietary treatments with 5 replications and14 birds were assigned to each replicate and a total of 70 birds made up a treatment. The birds were fed formulated diet table 1.The birds were housed in a deep litter with partitions using wire mesh. All birds received both feed and water *ad libitum*. Records on initial weight and at the end of every week are taken and kept. Feed eaten and left over records were maintained throughout the period of the experiment.

At the end of the finisher phase (56 days of age) two birds per replicate and 10 birds per treatment whose weights were close to the pen average were selected and properly identified by means of leg band numbers to correspond with the dietary treatment were sampled out for bleeding. Birds were fasted overnight and bled the following morning by severing the jugular veins and carotid arteries using a clean sharp table knife. Parameters measured include live weight, pluck weight and carcass cuts (Drum sticks, Breast, Neck, Wings,

Back, Thighs, Head and Shank). The organoleptic parameters measured include weights of abdominal fat, heart, liver, pancreas, gizzard, intestine, spleen, kidneys, lungs and bile. Both carcass and organoleptic properties were expressed as percent live weight (%LW) before statistical analysis.

Table 1:Proximate Analysis of formulated Broiler Finisher Diets used in the experiments

Nutrients (%)	Bone Ash (T_1)	Rock Phosphate (T_2)	Dicalcium phosphate (T_3)	SEM
Crude Protein (CP)	20.25	20.25	20.25	0.00
Crude Fibre (CF)	5.35	5.45	5.30	0.04
Ether Extract (EE)	3.30	3.60	3.80	0.09
Nitrogen - Free Extract	60.48	59.99	60.25	0.14
Ash	4.12	4.21	4.40	0.08
Calcium	1.46	1.44	1.12	0.11
Phosphorus	0.66	0.66	0.70	0.01

SEM=Standard Error of Means

Data collected were subjected to one way Analysis of Variance (ANOVA) according to Statistical Package of Social Science (SPSS) using computer programme (version 20.0 of Window 2007 model) and identified significant difference mean values were separated using the Duncan's Multiple Range Test.

Results and Discussion

The effect of different sources of phosphorus on live weight, plucked weight and cut-parts of broiler finisher chickens(Table 2) were mostly not significant (p>0.05%. The result of live weight indicated no significant (p>0.05) effect among dietary treatments. The values obtained were slightly above values range of 1754.30 – 2641.30 g as reported by Ekeocha and Afolabi (2012). Plucked weight showed no significant (p>0.05) effect among dietary treatments. The result of this study agreed with the findings of Ekeocha and Afolabi (2012) who equally reported a non-significant variation with range values of 1582.97 – 2419.29 g. The breast did not indicate significant effect (p>0.05) among dietary treatments. This finding was higher than that of Oko and Etukudo (2011) who reported values range of 18.58 – 22.10 % (L W).The back weight obtained in this study showed no significant (p>0.05) variation among dietary treatments. The result of this work showed lower value as compared to that reported by Ekeocha and Afolabi (2012) who reported values range of 21.59 – 22.66 % (L W).

Table 2: The Effect of Different Sources of Phosphorus Inclusion on Live weight, Plucked weight and cut-parts of Broiler Finisher Chickens (56 days of age)

Parameters	Bone AshT_1	Rock Phosphate T_2	Dicalcium Phosphate T_3	SEM
Live weight (L W) (g)	2137.60	2092.60	2147.60	38.04 ^{NS}
Plucked weight (g)	1900.20	1890.20	1950.00	28.74 ^{NS}
Drum sticks (% L W)	9.16^{b}	9.03^{b}	11.17^{a}	0.34*
Breast (% L W)	22.81	24.50	25.63	0.91^{NS}
Neck (% L W)	7.32^{ab}	6.22^{b}	8.41^{a}	0.34*
Wings (% L W)	8.09^{b}	7.91^{b}	10.31^{a}	7.76 *
Back (% L w)	11.50	11.21	12.77	0.36 ^{NS}
Thighs (% L w)	19.45^{a}	16.52^{b}	20.91^{a}	0.69*
Head (% L w)	2.25	2.53	2.61	0.11^{NS}
Shanks (% L w)	3.69	4.08	3.84	0.10^{NS}

^{a,b}, Means within a row with same or without superscripts are not significantly different (p>0.05), SEM=Standard, Error of Means, *=Significantly Different (p<0.05), NS=Not Significantly Different (p>0.05), % LW= Percent Live Weight, T_1, T_2, T_3 = Dietary Treatment.

There was no significant difference (p>0.05) among dietary treatments for head weight in this study. The values obtained was similar to 2.52 – 3.49 % (L W) as reported by Oko and Etukudo, (2011).Shanks weight has no significant (p>0.05) difference among dietary treatments for this study. The finding was similar to that of Kayode *et al.* (2012) with values range of 3.06 – 3.87 % (L W).The result of drumsticks showed significant difference (p<0.05) among dietary treatments. Monsuru *et al.* (2012) reported significant variation in drumstick with a range value of 10.30 – 11.20 % (L W). The significant difference (p<0.05) among dietary treatments indicated that dicalcium phosphate performed better on drumsticks development than bone meal and rock

phosphate. The result of neck weight showed significant difference (p<0.05) among dietary treatments. This finding was slightly above reported values of 4.76 – 6.20 % (L W) (Oko and Etukudo, 2011). The result implied that dicalcium phosphate (T_3) had a better performance in neck development than other treatments. The wings weight showed significant difference (p<0.05) among dietary treatments. The result of this study was below that recommended by Ekeocha and Afolabi (2012) who reported range values of 11.98 – 12.50 % (L W). The significant difference (p<0.05) of this study was an indication that diet containing dicalcium phosphate performed better on wings than other diets. The result on thighs weight showed significant (p<0.05) difference among dietary treatments. The result of this study agreed with the value of 17.00 – 18.15 % (L W) reported by Ekeocha and Afolabi (2012). The significant (P<0.05) difference indicated that bone meal and dicalcium phosphate put a better performance on thighs than rock phosphate

The result of gizzard weight did not show significant difference (p>0.05) among dietary treatments. Hosseini-Vashan *et al.* (2010) reported similar mean value of 2.51 % (L W).The intestine weight did not show significant difference (p>0.05) among dietary treatments. The result of this study was within the range values of 2.89 – 8.48 % (L W) reported by Kayode *et al.* (2012).Result for spleen weight indicated no significant difference (p>0.05) among dietary treatments. The finding of this study agreed with values of 0.01 – 0.16 % (L W) as reported by Kayode *et al*. (2012). Kidneys weight did not show significant (p>0.05) effect among treatments. The result of this study was higher than the mean values of 0.07 – 0.08 % as reported Oko and Etukudo, (2011).The Lungs weight did not show significant difference (p>0.05) among experimental diets. The finding in this study was similar to that of Oko and Etukudo (2011) who reported values that ranged between 0.32 % and 0.42 % (L W).The result of bile weight showed no significant difference (p>0.05) among dietary treatments. The finding of this study was above 0.06 – 0.09 % (L W) reported by Kayode *et al.* (2012).

Table 3: The Effect of Different Sources of Phosphorus Inclusion on Abdominal Fat and Internal Organs of Broiler Finisher Chickens (56 days of age)

Parameters	Bone AshT_1Rock Phosphate T_2Dicalcium Phosphate T_3			SEM
Abdominal fat (% L w)	1.94	2.28	2.23	0.11^{NS}
Heart (% L w)	0.42	0.46	0.43	28.74^{NS}
Liver (% L w)	1.74	1.95	1.41	0.12^{NS}
Pancreas (% L w)	0.15	0.16	0.18	0.01^{NS}
Gizzard (% L w)	2.89	3.32	2.48	0.17^{NS}
Intestine (% L w)	4.07	4.42	3.95	0.15^{NS}
Spleen (% L w)	0.07	0.31	0.12	0.08^{NS}
Kidneys (% L w)	0.29	0.42	0.36	0.03^{NS}
Lungs (% L w)	0.54	0.49	0.49	0.02^{NS}
Bile (% L w)	0.12	0.14	0.11	0.10^{NS}

SEM=Standard Error of Means, NS=Not Significantly Different (p>0.05), % Lw = Percent Live Weight,T_1, T_2, T_3 = Dietary Treatment

Conclusion and Recommendation

The result of this study showed that at 2.5 Kg per 100 Kg diet, rock phosphate can be utilized without adverse effect on carcass yield and organoleptic properties of broiler chicken. This also means that diets containing rock phosphate compete favourably with bone meal which served as a control and therefore is safe for broiler chickens production.Effort should be geared towards finding out effect of higher quantities of inclusion in broiler chicken diet and also finding procedures or techniques of removing/reducing fluorine content as the case may be from raw rock phosphate in order to increase its potential feed value for poultry industry.

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