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Response of Finishing Broilers Fed On-Farm Feed to Dietary Enzyme and Vitamin B Supplementation

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Abstract: *The objectives of the feeding trial were to evaluate the response of finishing broilers to commercial feed (diet A) and on-farm formulated diets supplemented with maxigrain enzyme (diet B) and maxigrain and vitamin B(diet C). A total of ninety 6 week old broilers were used for the feeding trial on deep litter. The finisher experiment lasted from 6-8 weeks. Feed and water were given ad libitum. Supplementation with enzyme and or vitamin B significantly (P<0.05) increased weight gain, final live weight, feed intake and feed conversion efficiency. However, birds fed diets supplemented with enzyme alone performed better than (P<0.05) the birds fed diets supplemented with enzyme and vitamin B (diet C) and the control (diet A) in terms of weight gain, final live weight, feed intake and feed conversion efficiency. The cost of feed/kg was lowest (P<0.05) with the diet supplemented with enzyme alone followed by the diet supplemented with a combination of enzyme and vitamin B. Feed cost/ gain in weight was also highest (P<0.05) on the commercial diet (A). Results of the haematological variables showed significant differences (P<0.05) with respect to the PCV, RBC, WBC, Hb, MCH, MCV and MCHC. Live weight, carcass weight, dressing percentage, breast, thigh, drumsticks, varied significantly (P<0.05). However, liver and heart were statistically similar (P>0.05) for the three diets. The supplemented diets were cheaper to produce than the commercial one besides resulting in more economic production of broiler and better live weights. It is recommended that poultry farmers formulate and fortify their feeds using available feed resources for better profitability.*

Keywords: *Commercial A, On-farm, Broiler, Enzyme, maxigrain*

1. INTRODUCTION

The production of poultry products appear to be on the increase as a way of ameliorating shortage of animal protein intake being experienced in many developing countries. Poultry is the quickest source of meat and its production involves the least hazardous and arduous process in relation to other livestock species [12]. However, the explosive demand for poultry products has evolved a fierce competition between the poultry industry and humans for conventional feed grains [2]. Consequently, the cost of conventional feedstuffs which are major sources of energy and protein in poultry diets has continued to increase [6]. This has resulted in high cost of broiler feeds, causing economic losses in broiler production enterprise in Nigeria [1].

According to [13], while, the poultry farmers desire to have optimum production capacity at least cost, some feed millers undermine the efforts of the poultry farmers by presenting substandard feeds to unsuspecting farmers. Many farmers, though ignorant of the nutrient composition of feedstuffs and procedure of feed production, are left with no other choice than to formulate and compound their own feeds. The effect of which manifest in form of poor performance and delay in the attainment of market weight of broilers [5]. As a result of increasing request for on-farm formulations from non-conventional feed resources such as agro-industrial by-product (maize offal, brewers' dried grains, rice brain, wheat offal and palm kernel cake among others), there is need to improve the utilization of on-farm formulated feeds through the addition of commercial

enzymes such as maxigrain and vitamins in order to improve utilization by poultry. Maxi grain has been widely used in broiler chickens to improve fibre digestion and growth performance [9], while vitamin B complexes are added as supplement to broiler diets to improve on livestock production performance, growth, health conditions, activate metabolic processes and increase resistance of broiler chickens to diseases [16].

The objectives of this study were to evaluate the response of finishing broilers to commercial (A) diet and on-farm formulated diets supplemented with maxigrain enzyme and maxigrain and vitamin B.

2. MATERIALS AND METHODS

2.1. Experimental Site and Diets

This experiment was conducted at the Poultry Unit of the Teaching and Research Farm of Kogi State University, Anyigba which is located between Latitude 7^0 15'N - 7^0 29'N and Longitude 7^0 11^0E - 7^0 29'N [7], in the Derived Savanna zone of Nigeria.

The feed materials used were commercial (A) obtained from a reputable distributor at Anyigba, Kogi State, Nigeria and two on-farm feed. Maxigrain$^{(TM)}$ enzyme was used at recommended rate of 100g for one ton. Also, Zestup$^{(TM)}$ vitamin B complex was added to the feed at the rate of 4 tablets/50kg. Diet B was on-farm feed supplemented with maxigrain while diet C was on-farm feed supplemented with both maxigrain and vitamin B. The vitamin B tablets were grinded before incorporation with other ingredients of diet C. All the experimental diets were subjected to proximate analysis using the procedure of AOAC [4].

Table1. *Gross composition of on-farm finisher broiler experimental diets*

Ingredients	Diet B	Diet C
Maize (%)	31.35	31.35
Soybean (%)	30.30	30.30
Maize offal (%)	35.00	35.00
Bonemeal (%)	2.70	2.70
Methionine (%)	0.20	0.20
Salt (%)	0.20	0.20
[1]Premix (%)	0.25	0.25
Enzyme (g)	0.10	0.10
Enzyme (g)	0.10	0.10
[2]Vitamin B (mg)	-	4 tablets
Total	100	100

[1]Premix contains the following/kg of diet:-Vit. A, 13, 340i.u; Vit. D3, 2680i.u: Vit. E, 10i u; Vit. K,2.68mg:Calcium Pantothenate, 10.68; Vit. B12, 0.00mg; Folic acid, 0.66mg; Chloride, 400mg; Chlorotetracycline, 26.68mg; Manganese, 13 mg; Zinc, 53.34mg, Copper; 3.2mg, Iodine, 1.86mg; Cobalt, 0.268mg; Selenium, 0.108mg.

[2]Each tablet of vitamin B contains; vitamin B1 = 1mg, vitamin B2 = 1mg, vitamin B6 = 1mg, niacinamide = 15mg

2.2. Experimental Birds and Management

A total of ninety 6 week old broilers were used for the feeding trial on deep litter. The 90 birds were randomly distributed into three (3) treatment groups, of three replicates each and assigned to dietary treatments having: a commercial feed (A) marketed in Nigeria, on-farm formulated diet B containing maxigrain and another on-farm formulated diet C supplemented with a combination of maxigrain and vitamin B. The finisher experiment lasted from 6-8 weeks. Feed and water were given *ad libitum*.

2.3. Data Collection and Analysis

The birds were weighed at the start of the feeding trial and subsequently on weekly basis using a top loading weighing scale. The mean initial live weights were subtracted from the mean final live weights to determine the weight gained by the birds. Feed offered to the birds were weighed weekly and leftovers were also weighed to determine the feed intake of the birds. At the end of the study, one bird per replicate i.e. three birds per treatment were randomly selected, weighed

haematological indices evaluation, and later slaughtered for carcass evaluation. Blood samples were collected from the wing web into sample bottles with EDTA and evaluated according to the procedure of Jain [8]. Performance data were collected on feed intake, weight gain, final weight and feed conversion ratio. Haematological indices evaluated included packed cell volume (PCV), haemoglobin (Hb), red blood cell (RBC), white blood cell (WBC), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC). Data on carcass were live weight, dressed weight, dressing percentage, breast weight, thigh weight, drumsticks weight, liver weight, heart weight and gizzard weight.

Data collected were subjected to analysis of variance (ANOVA) and differences between treatment means were separated using the Least Significant Difference (LSD) procedure as described by Snedocor and Cochran [18].

3. RESULTS AND DISCUSSION

Table 2 shows the proximate composition of the experimental diets. Dry matter, crude protein, crude fibre, ether extract, nitrogen free extract and ash values ranged from 88.60-89.4%, 21.04-21.44%, 5.20-10.20%, 4.80-9.40%, 41.96-54.16% and 4.20-5.00%, respectively. The crude protein values were slightly higher than the recommended protein requirement for finishing broiler in Nigeria. While crude fibre values for diets B and C were higher than the recommended level for broiler finisher diet.

Table2. *Proximate composition of the experimental diets*

Nutrients (%)	A	B	C
Dry matter	89.40	88.00	88.00
Crude protein	21.04	21.44	21.44
Crude fibre	5.20	10.20	10.20
Ether extract	4.80	9.40	9.40
Nitrogen free extract	54.16	41.96	41.96
Ash	4.20	5.00	5.00

3.1. Performance of Finisher Broilers Fed the Experimental Diets

Observed results for performance are shown in Table 3. Supplementation with enzyme and or vitamin B significantly ($P<0.05$) increased weight gain, final live weight, feed intake and feed conversion efficiency. However, birds fed diets supplemented with enzyme alone performed better than ($P<0.05$) the birds fed diets supplemented with enzyme and vitamin B (diet C) and the control (diet A) in terms of weight gain, final live weight, feed intake and feed conversion efficiency. The cost of feed/kg was lowest ($P<0.05$) with the diet supplemented with enzyme alone followed by the diet supplemented with a combination of enzyme and vitamin B. Feed cost/ gain in weight was also highest ($P<0.05$) on the commercial diet (A). The better performance observed for birds fed diets supplemented with enzyme alone and enzyme cum-vitamin B against birds fed commercial diet (A) is in line with the report by [15] when they worked with starter broilers. The workers opined that the observed trend in feed intake was connected with palatability and acceptability of the diets. The nitrogen free extract (NFE) values which might be an indicator of digestible carbohydrate and by extension energy may have also resulted in the observed trend for feed intake. Birds are reported to eat to satisfy their energy needs if fed *ad libitum* [10]. There is a possibility that the trend observed for intake also influenced the trend in daily weight gain besides the effect of the exogenous enzyme. According to [15], on-farm supplemented diets are cheaper than commercial feed, the trend which was also observed in this feeding trial.

3.2. Haematology of Finisher Broilers Fed the Experimental Diets

Results of the haematological variables (Table 4) showed significant differences ($P<0.05$) with respect to the PCV, RBC, WBC, Hb, MCH, MCV and MCHC. This shows that the experimental diets promoted varied haematological development in the birds. The PCV values observed also fell within the normal range reported for healthy birds [11; 14]. Observed RBC values were above the range reported by [11] for healthy birds, while WBC and MCV were higher than the range reported by [14] for healthy birds. This may suggests that the birds were not under any nutritional stress due to the treatments, and were therefore healthy.

Table4. *Haematological indices of finisher broilers fed the experimental diets*

Parameters	A	B	C	LOS
PCV %	$36.50^{b} \pm 3.84$	$37.39^{a} \pm 3.13$	$37.69^{a} \pm 2.77$	*
Hb (g/l)	$187.66^{c} \pm 33.24$	$199.66^{a} \pm 11.50$	$197.66^{b} \pm 28.05$	*
WBC ($x10^{9}$/l)	$7.38^{b} \pm 3.94$	$7.30^{b} \pm 4.52$	$8.40^{a} \pm 1.87$	*
RBC ($x10^{12}$/l)	$5.97^{a} \pm 3.00$	$6.51^{a} \pm 2.06$	$5.08^{b} \pm 3.10$	*
MCH (pg)	$374.29^{b} \pm 179.66$	$329.48^{c} \pm 115.52$	$471.67^{a} \pm 209.42$	*
MCV (g/l)	$72.27^{b} \pm 33.12$	$61.21^{c} \pm 19.91$	$91.73^{a} \pm 42.97$	*
MCHC (%)	$511.60^{c} \pm 37.48$	$535.25^{a} \pm 27.08$	$521.09^{b} \pm 41.29$	*

PCV-Packed cell volume, Hb-Haemoglobin, WBC-White blood cell

RBC-Red blood cell, MCH-Mean corpuscular haemoglobin

MCV-Mean corpuscular volume, MCHC-Mean corpuscular haemoglobin concentration

abc = Means with different superscripts on the same row differ significantly ($p<0.05$)

NS = Not Significant ($p>0.05$)

LOS = Level of significance

* = Significant at ($P<0.05$)*

3.3. Carcass Characteristics of Broilers Fed the Experimental Diets

Observed weights of carcass cut parts and organ are shown in Table 5. Live weight, carcass weight, dressing percentage, breast, thigh, drumsticks, varied significantly ($P<0.05$). However, liver and heart were statistically similar ($P>0.05$) for the three diets. This may suggest that the on-farm diets and the commercial diet had similar effects on these organs. Live weight value of diet B was similar to diet C, which was also superior to diet A. There was no statistical difference ($P>0.05$) between C and A in terms of liver weight. The results of the carcass analysis is in line with the findings of [3] who reported that dietary enzyme supplementation increased meat yield of broilers significantly which is attributable to higher fat deposition in carcass and also for increased breast meat yield. These results also agree with the results of previous work by [17]. The increase in the size of the gizzard in the supplemented group may not be unconnected with the level of fibre in the diets. This organ might have enlarged in order to facilitate the grinding function of the fibre.

Table5. *Carcass characteristics of finisher broilers fed the experimental diets*

Parameters	A	B	C	LOS
Live weight (kg)	$1.96^{b} \pm 0.15$	$2.15^{a} \pm 0.13$	$2.03^{ab} \pm 0.57$	*
Carcass weight (kg)	$1.60^{b} \pm 0.17$	$1.80^{a} \pm 0.32$	$1.67^{ab} \pm 0.14$	*
Dressing percentage (%)	$81.23^{c} \pm 3.15$	$83.73^{a} \pm 0.32$	$82.26^{b} \pm 2.48$	*
Breast (%)	$25.25^{a} \pm 0.98$	$23.67^{b} \pm 1.54$	$25.39^{a} \pm 0.22$	*
Thigh (%)	$13.58^{b} \pm 2.19$	$12.09^{c} \pm 1.51$	$14.90^{a} \pm 2.54$	*
Drumsticks (%)	$10.52^{b} \pm 1.46$	$11.50^{a} \pm 0.74$	$11.76^{a} \pm 0.40$	*
Liver (%)	2.57 ± 1.25	2.79 ± 0.35	2.74 ± 0.58	NS
Heart (%)	0.63 ± 0.70	0.55 ± 0.03	0.59 ± 0.03	NS
Gizzard (%)	$2.43^{b} \pm 0.47$	$3.68^{a} \pm 1.50$	$3.98^{a} \pm 2.72$	*

abc = Means with different superscripts on the same row differ significantly ($P<0.05$)

NS = Not Significant ($P>0.05$)

LOS = Level of significance

* = Significant at ($P<0.05$)*

4. CONCLUSION

The on-farm diets in this experiment resulted in better performance than the commercial diet going by the parameters measured. Addition of diet supplemented vitamin B to the enzyme in diet C did not produce any added effect but rather added to the cost of feeding the birds. The supplemented diets were cheaper to produce than the commercial one besides resulting in more economic production of broiler and better live weights. It is recommended that poultry farmers formulate and fortify their feeds using available feed resources for better profitability

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