

## **Growth Response of Broiler Chickens Fed Diets Containing Blood Meal with Enzyme Supplementation as a Replacement for Fish Meal**

K. U. Anoh<sup>1</sup> and S. O. Akpet<sup>2</sup>

<sup>1</sup>Department of Animal Science, Ahmadu Bello University Zaria, Nigeria

<sup>2</sup>Department of Animal Science, Cross River University of Technology (CRUTECH), Calabar, Nigeria

---

**Abstract:** A feeding trial was conducted to evaluate the growth response of broiler chickens fed diets containing blood meal with enzyme supplementation as a replacement for fishmeal. A total of two hundred and forty (240) day old broiler birds with average initial weight of 60.00g were used. The birds were randomly allotted to four dietary treatments with three replicates of 20 birds each in a completely randomized design. The experimental diets were T<sub>1</sub> (the control), T<sub>2</sub> (0% blood meal and 10% fish meal without enzyme), T<sub>3</sub> (5% blood meal and 5% fish meal with enzyme) and T<sub>4</sub> (10% blood meal 0% fish meal with enzyme). The diets were compounded to be iso-caloric and iso-nitrogenous. Feed and water were given ad-libitum. The result showed that in the starters phase, there was significant ( $p < 0.05$ ) difference in all the parameters measured except in the feed to gain ratio. Treatment 3 recorded the highest value in all the parameters including mortality while the control recorded the least. In the finishers phase, it was shown that there was no significant difference in the final weight and the average daily weight gain except in feed intake, feed to gain ratio and feed cost per kg gain which showed a significant ( $p < 0.05$ ) difference. Treatment 3 also gave better result compared to the other treatments. There was no mortality in this phase. This result showed that blood meal can be used with enzymes supplementation up to 10% in the diets of broilers without any adverse effect on growth performance.

**Key Word:** Enzyme, Feed intake, Weight gain, Feed cost.

---

### **I. Introduction**

Research for cheaper feed stuffs has been the concern of animal nutritionists in the present day research in the tropics because of the geometric increase in the price of conventional feed stuffs and feed. In Africa especially Nigeria this increase in price is not only occasioned by the competition that is existing between man and livestock, but also to circumstances such as, ethno-religious crisis, natural disasters, political instability, poor implementation of government policies etc.

The cost of feed ingredients usually ranges from 65-75% of the total cost of poultry production. This problem has led to a reduction in the rate of expansion of poultry industry and has added to the low level of animal protein intake of the populace. A possible way of increasing the supply of poultry production at a cheaper price is by reducing the cost of production through the use of cheaper and locally available livestock ingredients.

Recycling of slaughterhouse wastes, as feed for various categories of livestock has been a continuous subject of investigation [1, 2 and 3], the use of blood meal in poultry diet was explored in this experiment.

Blood meal has been reported to contain about 80-85% crude protein. This variation is due to differences in processing methods [4]. Blood meal is one of the richest sources of lysine, arginine, methionine, cystine, and leucine but very poor in isoleucine and contains less glycine than fish meal [5].

Most of the fishmeal used in poultry diets in Nigeria are not just expensive but are also contaminated and of poor value. The use of blood meal in poultry diet is not popular, more so, blood meal has not been recommended to be used beyond 5% [6] because the digestibility of blood meal was not as efficient as fish meal [7]. Several researches [8, 9 and 10] with the use of blood meal in broiler diet showed that performance declined lineally with increasing levels of blood meal which was more significant beyond 5 per cent inclusion level. It has been reported that amino acid imbalance may have been the cause of reduced performance in those early studies [11]. Alzyme enzyme is been reported by the producers to have the ability of releasing nutrients tied down by either anti-nutrients or other factors in ingredients to be available. This study was therefore design to evaluate the effect of blood meal with enzymes supplementation as a replacement for fish meal on the performance of broiler chicken.

## **II. Materials and Methods**

### **1.1 Experimental Site**

This study was conducted at the poultry unit of College of Agriculture and Animal Science Division of Agricultural colleges ABU Mando Kaduna, located in Northern Guinea Savannah zone of Nigeria.

### **1.2 Source and Processing of Blood Meal**

Blood was collected from cattle during slaughtering in abattoir within Kaduna Nigeria. The blood was properly boiled, sundried until it was properly dried after which it was milled.

### **1.3 Experimental Diet**

Four (4) iso-nitrogenous and iso-caloric diets (Table 1) were formulated to meet the NRC [5] nutrient requirement for broiler starter and finisher birds. Treatment 1 was the control without blood meal and fishmeal, treatment 2 contained 10% fish meal without blood meal, treatment 3 contained 5% blood meal with 100g enzyme and 5% fish meal and treatment 4 contained 10% blood meal with 100g enzyme without fish meal. Each of the diet constituted a treatment and each treatment was replicated 3 times with 20 birds per replicate in a completely randomized design.

### **1.4 Laboratory Analysis**

Samples of compounded diets were taken to the biochemistry laboratory of the Department of Animal Science, Ahmadu Bello University for proximate analysis. The samples were analyzed for dry matter (DM), Crude fibre (CF), Ether extract and Ash. NFE was determined using the following formula  $NFE = 100 - (CP + CF + EE + ash)$ .

The proximate analysis was carried out according to the method of [12].

### **1.5 Design and Management of Birds**

Two hundred and forty (240) day old broiler chicks gotten from a hatchery in Ilorin, Nigeria were used. Fumigation was done 2 weeks prior to the arrival of the chicks. Chicks were brooded under convenient temperature for 0-4 weeks, feed and water was given *ad-libitum*. Vaccines as was recommended by the Veterinary Doctor was administered, mortality of birds was recorded as it occurred.

### **1.6 Parameters Monitored**

Parameters measured for both experiments were the initial body weight, final weight, feed intake while weight gain, feed to gain ratio, feed cost/kg gain, and mortality were calculated and recorded as secondary data.

### **1.7 Statistical Analysis**

All data generated were subjected to the analysis of variance technique according to completely randomized design using the general linear models SAS software [13]. Significant differences between means were separated using Duncan's Multiple Range Test in the SAS package.

## **III. Results and Discussion**

The result (Table 2) showed that the final weight, average weight gain, feed intake, feed to gain ratio as well as mortality showed a significant difference ( $p < 0.05$ ) there was no significant difference in the feed to gain ratio. Treatment 3 recorded a better performance compared to the control; the value was similar to those of treatment 2 and 4. The trend in weight gain and feed to gain ratio was a reflection of their feed intake. The values of feed cost per kg gain showed that more money was saved in treatment 4 compared to treatment 3. This value was similar to the control and treatment 2. The percentage mortality of birds showed that there was no mortality in the control; treatment 3 with 5% fishmeal and 5% blood meal with enzyme recorded the highest percentage mortality. In the finishers phase, the result (Table 3) showed that there was significant ( $p < 0.05$ ) difference in all the parameters except in the final weight and average daily weight gain that did not show any significant difference. There was a linear increase in feed intake with a decline in treatment 4. There was also a carryover effect of the growth performance from the starters phase to the finisher phase. Treatment 3 recorded a higher value while treatment 1 (control) recorded the least. The values of the average weight gain were a reflection of the feed intake. The values of feed cost per kg gain showed that more money was spent in treatment 2 and 3 compared to the control. There was no mortality in this phase.

The control diet without fish meal or blood meal performed poorly compared to other treatments. The values of feed intake and weight gain recorded in this experiment contradict the values reported by [6] when blood was used to replace fish meal in layers diet. Donkoh [8] reported that weight gain in broiler chicken was reduced with higher concentration of blood meal due to very low levels of sulphur containing amino acids and isoleucine are responsible for the poor utilization of blood meal. The result of this study was different with the

reports of [14] that combined blood meal with rumen digesta to replace groundnut cake or fishmeal in layers diet. He reported that there was low feed intake, weight gain, hen day egg production, egg weight and shell thickness in the birds that were fed the test diet. He however attributed his result to the unpalatable nature of the diet due to the influence of rumen digesta. The combination was reported to have an unpleasant smell which led to poor feed intake and subsequently poor output. Poor performance reported by previous studies on the utilization of blood meal beyond five percent (5%) indicated that high amount of amino acids is responsible for improve efficiency of utilization of feed in broilers. From this study it appears that the improved performance of broilers on the utilization blood meal beyond 5% could be due to the enzyme supplemented which brought about an increased in the available nutrients from the seeds ingredients. These nutrients supplied in combination with soy bean and blood meal may have led to proper amino acids interaction, which led to improved performance compared to earlier reports. The mortality recorded in this experiment may not have been caused by the diets as treatment 2 without blood meal also recorded mortality, the mortality could be attributed to adverse weather conditions. The rain was at its peak. The trend in final weight at the finishers phase was a reflection of the feed intake and growth performance of the birds. The zero mortality recorded in this phase could be because the birds were matured and had acclimatized to temperature changes.

**Table 1 Composition of experimental diets containing varying levels of blood meal**

Ingredients	Treatments							
	Starter Diets (0-4 weeks)				Finisher Diets (5-9 weeks)			
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
Maize	40.00	30.00	30.00	30.00	50.00	39.40	39.40	39.40
Soybean	25.86	26.24	26.24	26.24	25.12	25.92	25.92	25.92
Bloodmeal	-	-	5.00	10.00	-	-	5.00	10.00
Fish meal	-	10.00	5.00	-	-	10.00	5.00	-
GNC	20.00	20.00	20.00	20.00	10.00	10.00	10.00	10.00
Wheat Offal	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Bone meal	2.50	2.50	2.50	2.50	3.00	3.00	3.00	3.00
Limestone	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
DL-Methionine	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Vitamin premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
L-Lysine	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Salt	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Enzyme	-	-	0.01	0.01	-	-	0.01	0.01
Total	100	100	100	100	100	100	100	100
<b>Calculated Analysis</b>								
M. E. Kcal/kg	2812.80	2846.64	2866.04	2886.64	2923.56	2918.13	2923.72	2892.13
Crude Protein (%)	23.04	23.06	23.07	23.07	20.00	20.00	20.00	20.00

\*Vit. Premix supplied per kg diet : Mg, 300mg; Mn, 80mg; Fe, 80mg; ZN, 50mg; Cu, 3.5mg; I, 04mg; retinal acetate, 2.27mg; menaphtone, 1.3mg; riboflavin, 4mg; niacin, 25mg; pantothenic acid, 10mg; biotin, 50ug; cyancobalamin, 10ug.

**Table 2 Performance of broiler starter fed the experimental diets**

Parameters	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	SEM
	(Control)	(0%)	(5%)	(10%)	
Initial Weight (g/Bird)	60.00	60.00	60.00	60.00	0.00
Final Weight (g/Bird)	900.00 <sup>b</sup>	982.00 <sup>a</sup>	990.00 <sup>a</sup>	986.67 <sup>a</sup>	17.50
Average Wt gain (g/Bird/day)	30.70 <sup>b</sup>	33.67 <sup>a</sup>	33.90 <sup>a</sup>	33.80 <sup>a</sup>	0.20
Average feed intake (g/Bird/day)	77.50 <sup>b</sup>	87.97 <sup>a</sup>	90.07 <sup>a</sup>	85.20 <sup>a</sup>	1.35
Feed to gain ratio	2.53	2.60	2.67	2.53	0.50
Feed cost/kg gain (N)	210.27 <sup>a</sup>	206.62 <sup>a</sup>	234.27 <sup>b</sup>	205.90 <sup>a</sup>	4.17
Mortality (%)	0.00 <sup>a</sup>	5.00 <sup>b</sup>	10.00 <sup>c</sup>	5.00 <sup>b</sup>	0.80

<sup>abc</sup>mean in the same row with different superscripts are significantly different (P<0.05)FM:

**Table 3 Performance of Broiler Finisher Fed the Experimental Diets**

Parameters	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	SEM
	(Control)	(0%)	(5%)	(10%)	
Initial Weight (g/Bird)	900.00 <sup>b</sup>	982.00 <sup>a</sup>	990.00 <sup>a</sup>	986.67 <sup>a</sup>	17.50
Final Weight (g/Bird)	2500.00	2625.00	2800.00	2633.00	95.57
Average Wt gain (g/Bird/day)	64.60	64.05	65.21	63.80	4.55
Average feed intake (g/Bird/day)	179.90 <sup>c</sup>	229.73 <sup>b</sup>	267.30 <sup>a</sup>	217.37 <sup>b</sup>	4.50
Feed to gain ratio	2.90 <sup>a</sup>	3.60 <sup>ab</sup>	4.13 <sup>b</sup>	3.43 <sup>ab</sup>	0.25
Feed cost/kg gain (N)	227.67 <sup>a</sup>	315.03 <sup>b</sup>	338.10 <sup>b</sup>	260.13 <sup>ab</sup>	20.52
Mortality (%)	0.00	0.00	0.00	0.00	0.00

<sup>abc</sup>mean in the same row with different superscripts are significantly different (P<0.05)

#### IV. Conclusion

Blood meal with enzyme supplementation improved feed intake, weight gain and saved more money. It was therefore concluded that blood meal can be used up to 10% with enzyme supplementation in the diets of broilers without any adverse effects on growth performance. Furthermore, it is recommended that when using animal waste and by products in broiler diets, it should be supplemented with enzyme for proper utilization of other nutrients.

### References

- [1]. A. M. Kingori, J. K. Tuitoek and H. K. Muiruri, Comparison of fermented dried blood meal and cooked dried blood meal as protein supplements for growing pigs, *Tropical Animal health and Production*, (30), 1998, 191- 196.
- [2]. J. E. Swan, Animal by-product processing, In Hui, Y. H ( Ed), *Encyclopedia Food Science Technology*, 4, (1992), 42-49.
- [3]. K. U. Anoh, J. J. Oimage, A. M. Adamu, I. Abdullahi and S. O. Akpet, Nutrients Digestibility and Carcass Characteristics of Weaner Rabbit Fed Diets Containing Rumen Digesta from Cattle, Sheep and Goat, *International Journal of Applied Research and Technology*. 1 (7), 2012, 60 – 65.
- [4]. P. McDonald, R. A. Edward, J. F. D. Greenhalgh and C. A. Morgan, *Animal nutrition* (Longman publishers, 1998).
- [5]. NRC, *Nutrient Requirement for Poultry*, 9<sup>th</sup> Ed, ( National Academy Press, Washington D. C., U.S.A. 1994).
- [6]. I. I. Dafwang, J. M. Olomu, S. A. Offiong and S. A. Bello, The effects of replacing fish meal with blood meal in the diets of laying chickens, *Journal of Animal Production Research*. (6), 1986, 81-92.
- [7]. A. Haq and M. Akhtar, *Poultry Farming*, Higher Education Commission, Islamabad, Pakistan. (206), 2004, 221 – 231.
- [8]. A. Donkoh, C. C. Atuahene, D. M. Anang and S. K. Ofori, Chemical composition of solar-dried blood meal and its effect on performance of broiler chickens, *Elsevier: Animal Feed Science and Technology* (81), 1999, 299 – 30.
- [9]. A. Memon, N. N. Ansari, A. A. Solangi, and G. Memon, Effects of Blood meal on the growth and Carcass Yield of broilers, *Pakistan Veterinary Journal*. 22 (3), 2002, 97 – 100.
- [10]. K. Tabinda, H. K. Sohail and N. A. Noor, Effect of different levels of blood meal on broiler performance during two phases of growth. *International Journal of Poultry Science* 6 (12), 2007 860 – 865.
- [11]. R. Crawshaw, *Bloodmeal: a review of its nutritional qualities for pigs, poultry and ruminant animals*, National Renderers Association Technical Review, United Kingdom, (594), 1994, 7.
- [12]. AOAC, *Official methods of analysis* 15<sup>th</sup> Ed, (Association of official Analytical Chemist, Washington D. C., USA 1991).
- [13]. SAS, *Statistical Analysis System Institute, User guide*. 6<sup>th</sup> Ed (North Carolina USA, 2001).
- [14]. A. A. Odunsi, Blend of blood and rumen digesta as a replacement for fishmeal or groundnut cake in layer diet. *International Journal of poultry science*. 2 (1), 2003, 58 – 61.