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Performance of Broilers on Different Commercial Finisher Diets from 5th to 9th Week of Age

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ABSTRACT

Two hundred and sixty-four 5 weeks old broiler chickens were used in this study to test four different commercial finisher diets. These feeds were designated as Treatments 1,11,111 and 1V respectively. The main objective of the study was to evaluate the four commercial finisher diets on their ability to support performance of broiler chickens 5 to 9 weeks old. Proximate analysis of the feed was carried to assess any disparity in the composition. The birds were fed ad libitum. Body weight gain and efficiency of feed utilization were the criteria used to determine the quality of the respective feeds. The results of this study showed that treatment 11 supported the best performance, producing birds with average weight of 2038g as compared with 1816g, 1898g and 1892g for treatments 1, 111 and 1V respectively.

Keywords: *Performance, Broilers, Commercial Finisher Diets, Feed Utilization.*

INTRODUCTION

The poultry enterprise is a wide spread business in Nigeria: this has been attributed to the ease of raising poultry birds and to their adaptability to the Nigerian environment (Onwukwe, 1994). Modern poultry production was introduced in Nigeria in the late 50's (Ahaotu *et al.*, 2017a) when it became apparent that the expansion of cattle could not progress at a satisfactory rate to cope with the increasing demand for meat. This has resulted to the expansion of poultry which is estimated to be 133 million - consisting of about 123 million local fowls and 10 million exotic poultry (Onwukwe, 1994).

Although, the poultry industry has been well established in Nigeria, production has been low compared to the production report in the temperate countries. The causes of low production include management factors of which nutrition is perhaps the most critical. In these regards, the poultry feed manufacturers carry a major responsibility in ensuring that feeds meet the nutritional requirements of the birds (Ahaotu *et al.*, 2017b).

Commercial feed production of any significant nature in Nigeria did not start until about 1963 when the Ministries of Agriculture and Natural Resources of the then regions produced feed on a very small scale (Onwukwe, 1994). The nutritional requirement of a chicken can be divided into the maintenance and production requirements. It should be noted that for a broiler chicken to exploit its maximum genetic potential for meat production, its feed must be nutritionally balanced. A deficiency in a particular nutrient would not be conducive for economic production (Ononiwu *et al*, 2017).

Based on contemporary research, the nutritional needs of broiler chickens have been established, to guide the feed manufacturing industries. However, broiler chicken producers have experienced reduced performance in terms of body weight gain of birds on different commercial feeds. It may well be that some of these commercial feeds fail to meet the requirements for high production because of poor feed formulation.

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at the Poultry unit of the Teaching and Research farm, University of Uyo, Akwa Ibom State, Nigeria. The study area is located on latitudes 4°32′N and 5°33′N, and longitudes 7°25′E and 8°25′E as shown in Figs 1, 2 and 3.The state is located in the South-South geopolitical zone, and is bordered on the east by Cross River State, on the west by Rivers State and Abia State, and on the south by the Atlantic Ocean and the southernmost tip of Cross River State.

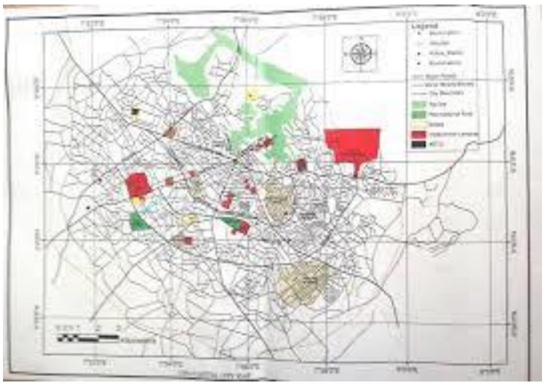

Fig1. *Map of Uyo Metropolis, Akwa-Ibom State, Nigeria.*

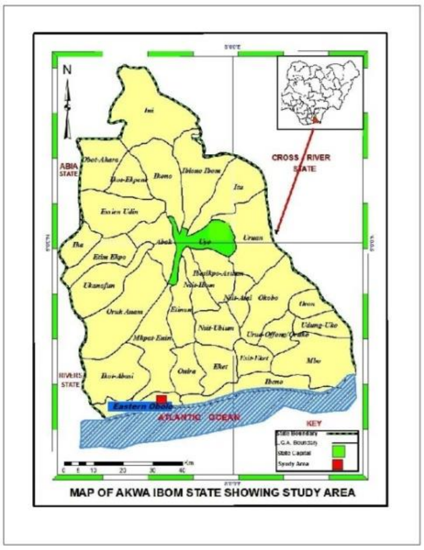

Fig2. *Map of Akwa – Ibom State Showing the study Area.*

Figure3. *Map of Nigeria showing the location of Akwa Ibom state (study area: Uyo Local Government Area).*

Experimental Animals

A total of two hundred and sixty-four birds were used in the experiment. These birds had been previously raised conventionally to five weeks of age on a common starter diet, during which they had been immunized against Gumboro and Newcastle diseases. They were then weighed and divided into eight equal weight groups of thirty-three birds each such that the weights of the groups were equalized. Two such groups were randomly assigned to one dietary treatment and there were four treatments.

The birds had an average initial weight of 732.75g. Feed and water were supplied *ad libitum*. The finisher diets used were obtained from commercial sources. Samples of these diets were subjected to proximate analysis to determine the fibre, protein, ether extract and ash percentages and were compared with the data shown on the labels. The data from the analysis and the commercial feeds with different labels are shown in Tables 1 and 2.

Weighted quantities of each feed were provided for the different treatment groups. At the end of one week, the feed intake for the week was determined.

The birds were further weighed to determine the weight gain for that week. The rations were fed up to 9 weeks of age, at which time, total feed consumed by each group and the gains in body weight were determined and used to calculate the efficiency of feed utilization. The data collected were subjected to analysis of variance and the differences were measured according to (Gordon and Gordon, 2014).

Records of mortality were maintained throughout the experimental period. At the end of the feeding period, four birds from each treatment group (two males and two females) were removed randomly for carcass evaluation. These birds were killed by cervical dislocation, after the live weights had been recorded. The dressed weights, eviscerated weights and the weights of certain parts and organs were obtained using the electronic digital balance. The relative weight of these parts and organs to the body as affected by treatments in the experiment were examined.

Table1. *Proximate Analysis of Feeds*

Treatments	Percentage (CF) Crude fibre	Percentage (CP) Crude protein	Percentage (CP) Ether extract	Percentage Ash
1	7.04	15.61	2.25	6.50
11	6.32	17.54	3.63	6.00
111	7.00	17.21	3.00	5.41
1V	6.40	17.82	5.13	4.29

Table2. *Nutrient Composition on the Feed Labels of Different Commercial Feeds.*

Treatments	Percentage (CF) Crude fibre	Percentage (CP) Crude protein	Percentage (CP) Ether extract	Percentage Ash
1	7.00	18.00	4.00	-
11	3.60	19.00	2.70	-
111	5.60	18.00	3.50	-
1V	5.00	19.00	5.00	6.40

Results and Discussion

Weight Gain

The mean weight gain of birds on the respective diets in the experiment is shown in Table 3. Treatment 11 with 1306g body weight gain was significantly higher than the gain of birds in the other treatments ($p<0.05$).

This superior gain in weight may have been due to the quality of nutrients in the feed. In treatment 111, the mean weight gain was 1165g, which was not significantly different ($p>0.05$) from those of treatments 1V and 1 which were 1159g and 1083g respectively.

Proximate Analysis

The proximate analysis of the commercial feed used in the experiment is shown in Table 1, compared with the nutrient composition of the commercial feeds (Table 2). The crude protein levels ranging between 15.51, 17.54, 17.21 and 17.82 percent respectively were lower than those carried on the respective labels. These protein levels are below the protein level of 18 – 20% recommended by NRC, (2004). However, crude protein level is not the only criterion of quality of dietary protein. Quality of protein is also determined by the amino acid makeup of the proteins. Treatments 11 containing 17.54 percent crude supported the highest gain of 1306g in body weight. This gain differed significantly from that of treatments 1, 111 and 1V containing 15.61%, 17.21% and 17.82% crude protein respectively which recorded the gains of 1083g, 1165g and 1159g respectively.

Added fat have been reported to improve efficiency of feed utilization and palatability (Onu *et al*., 2019). Comparing the fat levels in Table 1 and 2, there are variations in the fat contents of the different commercial feeds. The fat percentage on the label feed for Treatment 1 was 4 % while those for treatments 11, 111 and 1V were 2.70%, 3.50% and 5.00% respectively. However, on analysis the levels were lower for 1 and 111 which had 2.25% and 3.00% respectively.

Treatments 11 and 1V had above the level of fat indicated on the label. The fat content of treatments 1, 11 and 111 were within the levels recommended by National Research Council (NRC), (2004). Treatment 1V had a level of fat above the recommendation of 2-3 % given by NRC (2004).

True fat consists of glycerol and fatty acids. Birds need more of fatty acid in the form of linoleic and arachidonic fatty acids since they cannot synthesize them (Onyekwere *et al*., 2016).

Although Treatment 1, 111 and 1V had fat levels within the recommended levels, birds on these treatments did not show effective weight gain which may have been as a result of the presence of non-essential fatty acids in the feed. The fat content of treatment 11 may have been made up of essential fatty acids which resulted in a slightly more efficient utilization of the feed and better weight gain.

Crude fibre is made up of cellulose, hemicellulose and lignin and it gives bulk to the feed (Ahaotu, 2007). The crude fibre content of the feed on analysis showed that the diets 1, 11, 111 and 1V had 7.04%, 6.32%, 7.00% and 6.40% while the producers' percentage of crude fibre on the labels were given as 7.00%, 3.60%, 5.60% and 5.00% for treatments 1 to 1V respectively.

This implied that the feeds had cruder fibre than the recommended quantity. The crude fibre content of the diet in treatment 11 on analysis was 6.32% which was the lowest when compared with Treatments 1, 111 and 1V.

Since birds cannot digest fibrous feed, the performance of birds in Treatment 11, which had the least fibre level, may have been due to the lower percentage of crude fibre in the diet as compared to other treatments, which had higher levels of fibre.

A comparison of the ash percentages on the labels and that obtained through proximate analysis was only possible in the diet of Treatment 1V, since the percentage ash content was not specified for the other diets. The percentage ash on the label was higher than that obtained on analysis.

The proximate analysis of the feeds showed that the nutrient composition of the different commercial feeds used in this study differed from the nutrient composition carried on the labels. These differences may have been due to poor formulation.

Table3. *Performance of Broiler Chickens on Four Different Finisher Diets*

Parameters (Per Bird)	Treatment1	Treatment2	Treatment3	Treatment4
Average Initial Weight at 5th Week (g)	733	732	733	733^{NS}
Average Weight Body at 9thWeek (g)	1816^{b}	2038^{a}	1898^{b}	1892^{b*}
Average Weight Gain at 9thWeek (g)	1083^{b}	1306^{a}	1165^{b}	1159^{b*}
Average Feed Consumption (g)	851	822	809	813^{NS}
Average Feed Efficiency	2.91^{c}	2.46^{a}	2.88^{b}	2.68^{bc*}
Overall Feed Consumed Per Bird (g)	3404	3288	3236	3252^{NS}

*SEM - Standard error of mean; NS - Not significantly different ($p > 0.05$); *- Significantly different ($p < 0.05$).*

Feed Efficiency

Feed consumed relative to weight gain is used as the measure of efficiency of feed utilization by the birds. In this study, significant differences were observed among treatments 11 and 111 ($p<0.05$) as shown in Table 3.

Treatment 111 was not significantly different from treatments 1V and 1. Birds in treatment 11 had the best average feed efficiency than the other groups. Birds in treatment 1 had the poorest average efficiency value of 2.91.

Treatments 111 and 1V had an average feed efficiency of 2.88 and 2.68 respectively. This result showed that the diet in treatment 11 was more efficient, followed by the diet in treatment 1V.

Feed Consumption

The highest overall feed consumption of 3404g was recorded for treatment 1, while the birds in treatments 11, 111 and 1V consumed 3288g, 3236g and 3252g of feed per bird respectively, which were not significantly ($p>0.05$) (Table 3). Birds in treatment 1 consumed more feed followed by those in treatment 11 as compared with the other treatments, but treatment 11 exhibited body weight gain. This result agreed with the observations of (Ahaotu, 2007) that feed consumption of a bird depends on several factors among which are physiological mechanism of the bird, physical condition and nutrient density of the feed and the environment in which the birds are reared.

Since the birds were exposed to similar management conditions, the difference observed in performance in this regard must be due to the treatments applied which is the variable factor in the management. Birds in treatment one (1) had poor weight gain despite consuming more feed. This could be due to the substandard quality of feed.

The energy content of feed can also determine the rate of consumption of such feed. The energy level of the diet in treatment 1 may have been low, which resulted in the consumption of more feed. This observation agreed with Odoemelam*et al.*, (2020) who noted that there is a physiological relationship between feed intake and concentration of energy in the feed since feed consumption is regulated by energy content. Ahaotu *et al*., (2019) also observed that birds eat more of low energy feeds.

The more energy there is in a ration, the higher the protein level should be, because of the reduced intake (Odey *et al*., 2019). The proximate analysis showed that the feed in treatment 1 had a low protein level of 15.61% and a low-fat level of 2.25% which may have resulted in substandard ration thus resulting in poor weight gain and increased feed consumption. The implication of this in commercial broiler production is that a broiler bird producer using the diet in treatment 1 will be running at a higher cost of production than a producer using either the feed in treatments 11, 111 or 1V. Treatment 111 had the lowest mean feed consumption rate which could be due to a number of factors such as improper ration between energy and protein, poor palatability of the diet, among others, all of which are capable of resulting in lower feed intake and poor weight gain.

Body Weight

The final body weights in this study are shown in Table 3. These results showed that there were significant differences between the mean values of the various treatments at 9th week ($p<0.05$). Treatment 11 had the highest mean body weight of 2038g when compared with Treatments 111, 1V and 1 having 1898g, 1892g and 1816g respectively.

Various factors have been known to affect body weight. Uzoma *et al.*, (2019) observed that among other factors, weight of a bird is affected by age of the bird, environmental conditions, energy protein relationship and genetic factor.Is-Haaq*et al*,. (2018) attributed retardation in growth to deficiency of protein. Since all the birds were of the same age and of the same strain and were maintained in the same environment, it can be assumed that the diets in treatments 1 and 1V were deficient in some essential nutrients. Such inadequacies may probably be responsible for making birds on diets in these treatments have lower body weights, although none of the feed appeared to be low in chemical composition when subjected to proximate analysis, compared to the recommended requirements.

The significance of body weight lied in the fact it can attract a price in broiler marketing therefore, a diet which promotes body weight, as Treatment 11 has an economic advantage.

Body weight may be affected by the fat deposit. Ahaotu *et al*., (2018) reported that fat content of the broiler bird's carcass increases exponentially with a decrease in dietary protein. In agreement, Ebochuo *et al.*, (2017) observed an increase in fat deposit and a decrease in fleshing grade after feeding a protein deficient ration. The average body weight of a broiler bird as reported by Ayo-Enwerem *et al.*, (2017) and Ahaotu et al., (2015) for a period of 9 weeks was given as 1.6 to 2.0kg. The average body weight of birds in all the treatments in the study at 9th week fell within the range of 1.6 to 2.0kg. This showed that none of the diets in the treatments in the study contained less than minimum level of the essential nutrients necessary for minimum body weight.

Carcass Evaluation

The relative weights of the parts and organs are shown in Table 4. No significant different ($p>0.5$) was observed between the treatments.

Table4. *Effect of Some Different Commercial Diets on Live Weight, Dressed Weight and the Relative Weights of Some Carcass Organs and Parts of Slaughtered Chickens at 9th Week*

Parameters	Treatment 1	Treatment 2	Treatment 3	Treatment 4
Mean Live Weight (g)	1837.5	2062.5	1962.5	1887.5^{NS}
Mean Dressed Weight	95.23	92.10	93.60	92.70^{NS}
Mean Eviscerated Weight	65.30	66.70	66.60	66.00^{NS}
Wing Weight	3.20	4.40	4.50	3.80^{NS}
Thigh and Drumstick Weight	9.20	9.95	9.92	9.62^{NS}
Neck Weight	2.70	2.98	2.75	2.60^{NS}
Breast Weight	17.10	17.30	17.96	16.96^{NS}
Liver Weight	1.46	1.45	1.47	1.27^{NS}
Gizzard Weight	1.90	1.97	1.90	1.80^{NS}

SEM - Standard error of mean; NS - Not significantly different ($p > 0.05$).

Conclusion

Based on the results of this study, it appeared that the manufacturers of different commercial feeds do not always produce their feed to conform with analysis shown on the labels which usually conforms with the stipulated standards laird down by various international research councils. Care must be taken by any livestock farmer wishing to go into broiler bird production, to go for feed of high quality as in the case of that used in treatment 11, which proved to be the best among the four types compared.

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