



ASSESSMENT OF SELECTED COMMERCIAL BROILER CHICKEN DIETS SOLD IN, NIGERIA

¹Usman, Y., ²Muhammed, S. Z., ¹Gamawa, A. A., ¹Chongmobmi, M., ³Nuhu, Y.
³Muhammad, S. and ³Sabo. A.

¹Department of Animal Health Technology, Bauchi State College of Agriculture.
Bauchi PMB 0088

²Nigerian Custom Service Commission

³Department of Animal Production Technology, Bauchi State College of Agriculture.
Bauchi PMB 0088.

Bauchi State University, Gadau, Bauchi, Nigeria.

*Corresponding Authors' Email: gabarin320@gmail.com GSM: +2347039368989

ABSTRACT

The study was carried out to assess the utilization of some commercial broiler chicken diets, eight-week study was conducted using two hundred and fifty-five (255) day-old chicks randomly allotted to five diets each treatment diet was replicated three times and each replicate contained 17 birds each in a Completely Randomized Design. Feed and water were served ad libitum. Performance results showed that most parameters (daily feed intake daily weight gain and feed conversion ratio), at both starter and finisher phases were significantly ($P < 0.05$) influenced by the diets. Overall performance revealed that broiler chickens fed diet 3 had higher ($P < 0.05$) final weight (2530.56 g), followed by those on diet 1 (2293.36 g). Diets 2 (2293.36 g), 4 (2249.99 g) and 5 (2117.74 g) were similar and had lowest value. There was no significant influence ($P < 0.05$) of diet on carcass characteristics, however, some organ parameters differed significantly ($P < 0.05$) among treatments. Respective values of feed cost per kg and feed cost per kg gain were lower on diet 1 (₦274.00; ₦675.78) and higher on diet 5 (₦300.00; ₦774.15). It was concluded that diet 3 gave better performance in terms of final weight and total weight gain and is recommended for broiler chicken farmers.

Key words: Broiler, Chickens, Commercial, Diets, Performance

INTRODUCTION

The general objective of poultry nutrition is to maximize the economic production performance of birds. Diets are formulated to provide specified levels of nutrients that are needed for optimum performance. The main production criteria being growth rate, feed conversion ratio, health and body composition (Esonu, 2006). Considering the number of people venturing into poultry production business and mostly they could not formulate their own diets therefore they have to go for commercial diets. The consequence increased demand for commercial feeds and the prevailing upward prices of feed ingredients led to increasing tendency of feed millers to produce substandard feeds especially as the quality control agencies in the country are either less concern or non-functional. Depending on the region of production, feeding alone constitutes about 70% of the total cost of poultry farming (Diarra *et al.*, 2012). Most of the feed millers aim at high profit margin at the expense of quality of their products (Jones, 2005). It is important that only quality feeds are given to animals so as to maximize performance and production. However, some feed companies are undermining this necessity by presenting to the market substandard feeds. The resultant effect is poor animal performance low production and impaired national economic growth. The objective of this study is therefore to evaluate the extent to which some of the available commercial feeds sold in Bauchi markets meet the nutrient requirements for optimum performance and production of broiler chickens.

MATERIALS AND METHODS

Experimental Site

The experiments were conducted at the Poultry Unit, Teaching and Research Farm, Abubakar Tafawa Balewa University, Bauchi. Bauchi is located within the southern guinea savannah on latitude



10.31 N and longitude 9.84 E. Furthermore, it is 616 metres above sea level and is characterized by two well-defined seasons; Rainy season (May - October) and dry season (November - April). The average annual rainfall is 1009 mm, highest relative humidity 94 % (August) and the lowest 35% (February). Temperatures are between 13 – 17 °C (December – February) and 36 – 37 °C (March – April) (World Atlas, 2015).

Experimental Diets

Five different commercial broiler diets available and commonly used by broiler chicken farmers in Bauchi metropolis were used in the study. The diets were for convenience, designated as diets 1, 2, 3, 4 and 5. and their nutrient profile is presented in table 1.

Table 1: Nutrient Profile of Commercial Diets from five different Sources in Bauchi Metropolis

Diets Parameters	1	2	3	4	5
Starter Diets					
ME (MJ/kg)	11.67	11.67	12.08	11.67	11.67
CP (kg/ton)	230	220	220	210	220
CF (kg/ton)	50	49	55	50	60
Finisher Diets					
ME (MJ/kg)	12.08	12.50	12.08	12.50	12.92
CP (kg/ton)	185	190	200	190	180
CF (kg/ton)	50	50	50	50	61

ME= Metabolizable Energy. CP= Crude Protein. FC= Crude fibre.

Experimental Birds and their Management

A total of two hundred and fifty-five (255) unsexed, day-old broiler chicks obtained from a reputable hatchery were used for the experiment. Two weeks prior to the birds' arrival, the study pens were cleaned washed, disinfected and fumigated. Similar treatment was also made on the feeders, drinkers and other equipment. A week after, wood shavings were spread on the floor of the experimental pens to a depth of approximately 3 inches. Thereafter, adequate heating/lighting facilities, feeders, and drinkers were provided.

Experimental Design

The experiment was conducted in a completely randomized design (CRD), (Steel and Torrie, 1980).

Data Collection

Growth performance

Feed consumption, weight gain feed conversion ratio, and mortality were the performance parameters monitored during the study period. Initial live weights of chickens were taken at the beginning of the experiment, thereafter, weekly weights were determined. Daily weight gain (DWG) was obtained by dividing the weekly gain by 7. Daily feed intakes were also determined by subtracting the weight of left-over feed from the quantity offered the previous day. Feed conversion ratio on the other hand, was calculated from the relationship;

$$FCR = FI/WG \quad \dots \text{Equation (3)}$$

Where FCR= feed conversion ratio, FI= feed intake and WG= weight gain.

Mortalities were recorded for each treatment throughout the feeding trial.

Carcass analysis

At the end of the finisher phase, thirty-two birds, two from each replicate, were randomly selected from the five treatments (16 replicates) and fasted for 12 hours before slaughter. Each bird was weighed and slaughtered. Weights of carcasses and internal organs were immediately measured using an electronic balance calibrated in grammes. Dressing percentage (DP) was obtained using the relationship.

$$DP = \frac{CW}{LW} \times 100\% \quad \dots \text{Equation (4)}$$

Where DP= Dressing percentage, CW= carcass weight and LW= live weight.



Cost Benefit Analysis

Cost benefit of broiler production using selected commercial feeds was calculated using the following key indices.

- Feed cost per kilogram of each diet.
- The total cost of feed consumed per bird on each diet.
- Feed cost per kilogram weight gain.
- Cost saving

Data Analysis

Except for data on cost benefit, all data were analyzed using the One-way Analysis of Variance (ANOVA) through SPSS version 25.0. Difference between treatment means was separated using Duncan's Post Hoc method (Duncan, 1955).

RESULTS AND DISCUSSION

Performance of Broiler Chickens Fed Commercial Diets (1 – 4 weeks)

The results for performance of broiler chickens fed commercial diet during the starter phase is presented in Table 2. Except for initial weight, all other parameters were significantly ($P<0.05$) affected. Initial weight of birds did not differ significantly among diets and was between the range of 61.51 and 69.16 g on diets 4 and 2 respectively. Week 4 weight of birds was higher ($P<0.05$) in birds fed diets 1 (958.88 g) and 4 (925.03 g) which were similar to those on diet 3 (882.48 g) and lower on diets 5 (854.94 g) and 2 (792.40) which were the same and comparable with diet 3. These higher weights could be attributed to the better energy and protein ratio and content of the diets which were reported to influence weigh gain (Onigemo *et al.*, 2015). Daily feed intake was higher ($P<0.05$) on diet 5 (61.57 g) which did not differ from diets 2 (59.22 g) and 4 (57.78 g). This might be informed by the lower energy content of the diet. birds tend to eat more of a low energy diet in order to meet the requirement for energy (Nahashon *et al.*, 2006). Diets 3 (55.18 g) and 1 (51.80 g) which had lower ($P<0.05$) mean values, favourably compared with diets 2 and 3. Daily weight gain was higher ($P<0.05$) on diet 1 (31.96 g) which was similar to diet 4 (30.84 g) and lowest on diet 2 (25.83 g). Feed conversion ratio was better in birds fed diet 1 (1.62) followed by those on diets 3 (1.89) and 4(1.87) while those on diets 2 (2.29) and 5 (2.18) were poorer. Mortality of only one bird was recorded on diet 3 throughout the starter phase.

Table 2: Performance of Broiler Chickens Fed Different Commercial Feeds (1-4 weeks)

Parameter	Diets					SEM
	1	2	3	4	5	
Initial weight (g)	64.08	69.16	66.00	61.51	65.34	4.74 ^{NS}
Week 4 weight (g)	958.88 ^a	792.40 ^b	882.48 ^a ^b	925.03 ^a	854.94 ^b	31.73 [*]
Daily feed intake (g)	51.80 ^b	59.22 ^a ^b	55.18 ^b	57.78 ^a ^b	61.57 ^a	1.60 [*]
Daily weight gain (g)	31.96 ^a	25.83 ^c	29.16 ^b ^c	30.84 ^a ^b	28.20 ^b ^c	1.16 [*]
Feed conversion ratio	1.62 ^a	2.29 ^c	1.89 ^b	1.87 ^b	2.18 ^b ^c	0.08 [*]
Mortality (No.)	0	0	1	0	0	

a,b,c,d Means within row with different **superscripts** differed significantly ($P<0.05$), SEM = Standard Error of the Mean, NS = Not significant

Performance of Broiler Chickens Fed Commercial Diets (5 – 8 weeks)

At the finisher phase, all performance parameters were significantly ($P<0.05$) influenced (Table 3). Final weight of birds on diet 3 (2530.56 g) was higher ($P<0.05$) than those on diet 1 (2293.36 g) while those on diets 4 (2249.99 g), 2 (2221.52 g) and 5 (2117.74 g) were lower and the same. Daily feed intake was higher ($P<0.05$) on diet 3 (156.54 g) which was same with diet 1 (144.67 g) and lower ($P<0.05$) on diets 4 (131.67 g), 2 (129.73g) and 5 (127.42 g) which were also the same. These values are comparable to 124.08 – 139.20 g reported by Hafizu *et al.* (2020) in a similar study. Daily weight gain was higher ($P<0.05$) on diet 3 (58.86 g) and lower on other diets (45.10 – 51.04 g).

The higher values of DWG obtained on diet 3 could be attributed to the higher feed intake in birds in that group (Onigemo *et al.*, 2015). Feed conversion ratio was better ($P < 0.05$) and same on diets 5 (2.83), 4 (2.78), 3 (2.66) and 2 (2.54) but poorer on diet 1 (3.04). These values are better than 2.86 – 4.89 reported by Hafizu *et al.* (2020) Mortality of 2 birds each was recorded on diets 1 and 2 while diets 2 and 4 had only one bird each.

Table 3: Performance of Broiler Chickens Fed Four Different Commercial Feeds (5 – 8weeks)

Parameter	Diets					SEM
	1	2	3	4	5	
Final weight (g)	2293.36 ^b	2221.52 ^c	2530.56 ^a	2249.99 ^c	2117.74 ^c	47.20*
Daily feed intake (g)	144.67 ^a	129.73 ^b	156.54 ^a	131.67 ^b	127.42 ^b	5.37*
Daily weight gain (g)	47.66 ^b	51.04 ^b	58.86 ^a	47.32 ^b	45.10 ^b	2.74*
Feed conversion ratio	3.04 ^c	2.54 ^a	2.66 ^b	2.78 ^b	2.83 ^{bc}	0.10*
Mortality (No.)	2	1	2	1	0	

a,b,c, means superscripts differed significantly ($P < 0.05$), **SEM** = Standard Error of the Mean, **NS** = Not significant

Overall Performance of Broiler Chickens Fed Commercial Diets (1 – 8weeks)

Results for overall performance of birds fed different commercial feeds are presented in Table 4. Except for initial weight and feed conversion ratio, all other performance indices were significantly ($P < 0.05$) affected. Total weight gain was highest ($P < 0.05$) on diet 3 (2530.56 g) followed by diet 1 (2229.28 g) and diet 4 (2188.47 g) which were the same, and lower ($P < 0.05$) on diets 2 (2152.35 g) and 5 (2052.40 g) which also did not differ. Daily feed intake was significantly ($P < 0.05$) higher on diet 3 (105.86 g), lower and the same on other diets (94.48 – 98.24 g). this agrees with Sanusi *et al.* (2015). A similar trend was recorded for daily weight gain. Birds on diet 3 (44.01 g) outweighed ($P < 0.05$) those on other diets (36.65 – 39.81 g) which were the same. No significant effect of diet was obtained for FCR (2.41 – 2.58). overall mortality was one bird each for diets 2 and 4 while diets 1, 3 and 5 had respective mortality figures of 2, 3 and 0.

Table 4: Performance of Broiler Chickens Fed Four Different Commercial Feeds (1- 8 weeks)

Parameter	Diets					SEM
	1	2	3	4	5	
Initial weight (g)	64.08	69.17	66	61.52	65.34	4.74 ^{NS}
Final weight (g)	2293.36 ^b	2221.52 ^c	2530.56 ^a	2249.99 ^c	2117.74 ^c	47.20*
Total weight gain (g)	2229.28 ^b	2152.35 ^c	2464.56 ^a	2188.47 ^b	2052.40 ^c	39.11*
Daily feed intake (g)	98.24 ^b	94.48 ^b	105.86 ^a	94.73 ^b	94.50 ^b	2.92*
Daily weight gain (g)	39.81 ^b	38.44 ^b	44.01 ^a	39.08 ^b	36.65 ^b	1.78*
Feed conversion ratio	2.46	2.46	2.41	2.42	2.58	0.08 ^{NS}
Mortality (No.)	2	1	3	1	0	

a,b, c, d. Means within row with different superscripts differed significantly ($P < 0.05$), **SEM** = Standard Error of the Mean, **NS** = Not significant

Carcass and Organ Characteristics of Broiler Chickens Fed Commercial Diets

Results for carcass and gut characteristics of broiler chickens fed different commercial feeds are presented in Table 5. None of the carcass indices was significantly affected. This disagrees with the report of Mukhtar and Rano (2019) when broiler chickens were fed commercial and self-formulated diets. However, some organ relative weights differed significantly among treatments. Live weight of birds at slaughter ranged from 2.18 – 2.30 kg on diets 5 and 4 respectively. Plucked weight was between 2.06 g (diet 5) and 2.14 g (diet 4). Eviscerated weight, on the other hand, was from 1.85g on diet 5 to 1.95 g on diet 1. Carcass weight ranged between 1.55 and 1.62 g on diets 5 and 4 respectively. Dressing percentage which also did not differ, was between 70.42% (diet 2) and 71.83%

(diet 3). These values are in conformity with 70.77% reported by Ravindran and Savakanessan (1996) for well-dressed broiler chickens.

Relative weight of head was significantly ($P < 0.05$) higher on 5 (1.78%), 2 (1.76%) and 1 (1.73%), and lower on diets 3 (1.55%) and 4 (1.54%). Leg weight ranged from 3.12% on diet 2 to 3.77% on diet 1 while spleen weight was from 0.12% (diets 1 and 5) to 0.15% (diet 4). Lungs weight was significantly ($P < 0.05$) higher on diets 1 (0.44%) and 2 (0.43%) which were similar to 0.41% (diet 5) and 0.40% (diet 4) but lower on diet 3 (0.36%) which was comparable with diets 4 and 5. Liver weight was higher ($P < 0.05$) on diets 1 (2.34%) and 4 (1.94%) which were the same and similar to diet 2 (1.57%) and lower ($P < 0.05$) on diets 5 (1.47%) and 3 (1.34%) which did not differ and comparable with diet 2. There was a significant effect of diet on abdominal fat weight, birds on diets 2 (1.30%) and 3 (0.91%) had higher ($P < 0.05$) abdominal weight than those on other diets (0.57 – 0.74%) which were the same. This could be as a result of varying energy content of the different feeds. Kassim and Swanpradit (1996) asserted that higher abdominal fat content is caused by higher dietary energy levels.

Table 5: Carcass and Organs Characteristics of Broiler Chickens Fed Commercial Diets

Parameter	Diets					SEM
	1	2	3	4	5	
Live weight (kg)	2.26	2.23	2.23	2.3	2.18	0.12 ^{NS}
Plucked weight (kg)	2.12	2.09	2.11	2.14	2.06	0.09 ^{NS}
Eviscerated weight (kg)	1.95	1.88	1.91	1.91	1.85	0.07 ^{NS}
Carcass weight (kg)	1.61	1.56	1.6	1.62	1.55	0.04 ^{NS}
Dressing percentage	71.15	70.42	71.82	70.61	70.77	3.68 ^{NS}
Organs weights expressed as per cent live weight						
Head	1.73 ^a	1.76 ^a	1.55 ^b	1.54 ^b	1.78 ^a	0.05*
Legs	3.77	3.69	3.12	3.19	3.41	0.40 ^{NS}
Lungs	0.44 ^a	0.43 ^a	0.36 ^b	0.40 ^{ab}	0.41 ^a	0.02*
Liver	2.34 ^a	1.57 ^{ab}	1.34 ^b	1.94 ^a	1.47 ^b	0.06*
Spleen	0.12	0.15	0.14	0.15	0.12	0.01 ^{NS}
Abdominal fat	0.74 ^b	1.30 ^a	0.91 ^a	0.57 ^b	0.65 ^b	0.09*
Heart	0.37	0.34	0.27	0.34	0.27	0.02 ^{NS}
Kidneys	0.46 ^a	0.53 ^b	0.38 ^b	0.43 ^b	0.33 ^b	0.05*
Gizzard	1.22 ^{ab}	1.26 ^a	1.08 ^c	1.11 ^b	1.08 ^c	0.08*
Pancreas	0.19	0.18	0.14	0.15	0.25	0.06 ^{NS}
Intestinal length	8.83	8.71	8.2	7.83	8.73	0.99 ^{NS}
Intestinal weight	3.64 ^a	3.08 ^b	3.62 ^a	2.82 ^c	3.09 ^b	0.08*

a, b,c Means within row with different superscripts differed significantly ($P < 0.05$), SEM = Standard Error of the Mean, NS = Not significant

Cost Benefit of Broiler Chickens Fed Different Commercial Feeds

Results for economic analysis of broiler production using different commercial diets is presented on Table 6. The results indicated that total feed intake in kilogram was highest on diet 3 (5.93 kg), followed by diet 1 (5.50 kg), diet 4 (5.30 kg) and diets 2 and 5 (2.29 kg). Feed cost in Naira per kg, was lowest on diet 1 (₦274.00), followed by diet 3 (₦284.00), diet 2 (₦292.00), diet 4 (₦294.00) and diet 5 (₦300.00) in that order. Total feed cost in Naira was highest on diet 3 (₦1684.12). This could be informed by higher total feed intake of birds on that feed. This was followed by ₦1587.00 (diet 5), then ₦1558.20 (diet 4), ₦1544.68 and ₦1507.00 (diet 1) in that order. Feed cost per kg gain was lower on diet 1 (₦675.78) and highest on diet 5 (₦774.15). this was due to the relatively higher total weight gain and lower feed cost per kg.



Table 6: Cost Benefit Analysis of Broiler Chickens Fed Different Commercial Diets

Parameter	Diets				
	1	2	3	4	5
Total feed intake (kg)	5.5	5.29	5.93	5.3	5.29
Feed cost /kg (₦)	274	292	284	294	300
Total feed cost (₦)	1507	1544.68	1684.12	1558.2	1587
Total weight gain (kg)	2.23	2.15	2.46	2.19	2.05
Feed cost per kg gain (₦).	675.78	718.46	684.6	711.51	774.15

CONCLUSION AND RECOMMENDATION

Based conclusion made in this study, the broiler chickens fed diet four (4) performed better than those on other diets, higher carcass yield, lower feed cost per kg gain and cost saving in naira per Kg gain was also achieved in diet four (4). Therefore, diet four (4) is recommended for broiler chickens feeding.

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