Nigerian J. Anim. Sci. 2023, 25 (3): 65-70

Evaluation of the proximate composition of four commercial broiler starter diets sold within Kaduna metropolis: a comparative laboratory based study

***[¥]Ndams, S.S., Dare, A. T. and Jantiku, H. J.**

[¥]Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria College of Agriculture and Animal Science, Ahmadu Bello University Mando-Kaduna, Nigeria.

***Corresponding Author:** samuelndams@gmail.com **Phone Number:** (+2348086183938)*

***Target Audience**: Poultry farmers; researchers; regulatory bodies and commercial feed producers*

Abstract

Evidence that the quality of commercial poultry feeds on the Nigerian markets may frequently be very poor has been established. Therefore, a laboratory study was conducted to evaluate the proximate composition of commercial broiler starter diets, for their suitability for broiler chicken's nutrition. Four samples of the broiler starter diets labeled "diets A, B, C and D were subjected to proximate analysis in the laboratory. Three samples (100g each) of the four diets were obtained separately from three poultry feed suppliers within Kaduna metropolis. The four diets differed significantly (P<0.05) from each other in percentage crude protein (%CP). The %CP of diet D was significantly (P<0.05) higher compared to the other diets, while diet B had the least (P<0.05) %CP. The metabolizable energy (ME) of diet A was significantly (P<0.05) higher compared to that of other diets. The %CP for diets C (22.72) and D (25.66) as well as the ME of all the diets was found to be adequate to support growth of broiler chicks. The %CF of diets A and B did not differ (P>0.05) but were significantly (P<0.05) higher compared to diet C and D. The percentage nitrogen free extract (%NFE) of diets A and C were similar (P>0.05) but significantly (P<0.05) higher than those of diets C and D. The result of this study has revealed that among the four commercial broiler starter diets sold within Kaduna metropolis, only diet C and D has adequate crude protein that could support broiler starter bird's growth performance.

Key words: Commercial broiler diets; proximate analysis; metabolizable energy; crude protein and crude fibre,

Description of Problem

On economic point of view, feed has been singled out as the most important element of animal production as it accounts for up to 70% irrespective of species (1) and up to 75% of the total production cost in poultry industry (2). The availability of feeds in a sustained manner, of desired quality and quantity will highly influences the livestock production system (3). A good quality feed will supply all the nutrients in adequate quantity with high palatability and digestibility (1). It is not tenable to consider one nutrient more important than another since all must be available to the animal in adequate amounts if efficient production is to be maintained (4). Broiler production at minimal cost requires feeds of high quality which should be maintained through the strict enforcement of quality regulations by the quality control regulatory body which in this case in Nigeria is the Standard

Organization of Nigeria (SON).

A study has revealed the evidence that the quality of poultry feeds on the Nigerian market may frequently be of very poor quality (4), therefore regulatory bodies must sample and have commercial feeds analyzed frequently. Analyzing feed samples chemically in the laboratory according to (5) can certainly provide good information on the nutrient or proximate composition of commercial poultry diets competing in our markets today. The objective of this laboratory study is to evaluate the proximate composition of four commercial broiler starter diets sold within Kaduna metropolis as confirmation for their suitability for broiler starter chicken's nutrition.

Materials and Methods

The Experimental Site

The experiment was carried out in the Department of Animal Production Technology, College of Agriculture and Animal Sciences, Ahmadu Bello University, Mando Road, Kaduna (11°10' N,07°38'E with elevation of 632m above sea level. An average rainfall of 1200mm with 95% falling between April and October. The temperature varies between 26 – 35ºC. The humidity at harmattan period is between 21 and 27% at the wet season). Mando is located in the Guinea savannah Zone of Nigeria (6).

The nature and sources of experimental materials

The experiment consisted of laboratory studies. This involved the determination of the proximate composition of four commercial feed samples. Three (3) samples of four (4) commercial broiler starter diets were obtained separately from three suppliers within Kaduna metropolis. The feed samples were identified as "A" Feed, "B" Feed, "C" Feed and "D" Feed and labeled: A_1, A_2, A_3; B_1, B_2, B_3; C_1, C_2, C_3 and D_1, D_2, D_3 and then taken to the lab for proximate analysis. The company's brand names of the different commercial feeds were not disclosed in consideration of the legal implications of the study. The proximate analysis was carried out at the Biochemical laboratory, Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria. The nutrient contents of the four commercial starter diets as indicated in their feed labels are as shown in Table 1.

Table 1: Nutrient contents of the four commercial broiler starter diets as indicated on the manufacturer's feed label

Nutrient content (%)	Diet A	Diet B	Diet C	Diet D
Crude Protein	20.00	21.00	22.00	22.00
Ether Extract	5.00	4.00	5.00	5.00
Crude fibre	5.00	5.00	5.00	4.30
Calcium	1.00	1.00	1.00	1.20
Phosphorus	0.45	0.20	0.40	0.45
Methionine + Lysine	0.86	1.65	1.55	1.01
¶Metabolizable Energy	3050	2,900	3,150	3,000

¶ME (Kcal/kg)

The Proximate Analysis

Proximate analyses were carried out on the 4 commercial feed samples for Dry matter (DM), Ash, Ether Extract (EE), Crude Fibre (CF), Nitrogen (N), and Crude Protein (CP). The Nitrogen Free Extract (NFE) was determined by difference. The analytical procedures (for DM, CF, CP, EE, Ash and

NFE determination employed in this experiment were in accordance to (7). The percent NFE was determined by difference using the following formula; % NFE = 100% − (% water + %ash + % fiber+% ether extract + % protein). The metabolizable energy of the four commercial broiler starter diets were determined by calculation according to the procedure of (8) as: ME (Kcal/kg) = 37 × %CP+ 81.8 × % fat + 35.5 ×%NFE

Data Analysis

All data obtained were subjected to analysis of variance (ANOVA). The statistical analyses were performed using the General Linear Model procedure of Statistical Analysis System (SAS). Significant means were compared using the Duncan Multiple Range Test (9) at 5% probability level.

Results and Discussion

The results of the proximate compositions of the different commercial diets (A, B, C and D) analyzed are as presented in Table 2.

Table 2: Proximate composition of four commercial broiler starter diets

*Parameter Analyzed	[a]Ranges	Commercial diets				SEM¶	SDµ
		Diet A	Diet B	Diet C	Diet D		
Dry Matter (%)	(85-95)	92.34[a]	90.56[d]	92.04[b]	91.43[c]	0.29	1.01
Crude Protein (%)	(22-24)	20.57[c]	19.83[d]	22.72[b]	25.66[a]	0.45	1.56
Crude fibre (%)	(4-5)	5.29[a]	5.33[a]	4.71[b]	4.37[c]	0.25	0.87
Ether extract (%)	[$](4-5)	2.61[d]	3.42[a]	3.16[b]	3.18[b]	0.20	0.69
Ash (%)	(4-8)	7.46[b]	7.56[b]	7.44[b]	9.00[a]	0.25	0.87
NFE (%)	[£](60-65)	63.70[a]	63.72[a]	61.78[b]	58.72[c]	0.91	3.15
M.E(kcal/kg)	(2800-3200)	3106.05[b]	3272.08[a]	3272.04 [a]	3272.04 [a]	120.0	415.69

[a,b,c,d] Means within rows with different superscripts are significantly different (P<0.05)

*Values represents means of three determinations, [a]NRC (1994), [$]Osman *et al*, (2021) [£]Aderingboye *et al*, (2022), [¶]SEM = Standard error of mean, [µ]Standard deviation (SD) = SEM x √n where n is number of treatments

There were variations between the nutrient contents of the four commercial diets obtained from the laboratory analysis and those observed from the feed labels supplied by the manufacturers of the four different commercial diets. In terms of percentage %CP, those of diets; A (20.57), C (22.72), and D (25.66%) were significantly higher than those indicated by the manufacturers (A (20.0), C (22.00) and D (22.00%). For the ME of the different diets, those indicated on the labels by the manufacturers were far below the ME values analyzed from the laboratory. The crude fibre percentages showed no significant variation between the laboratory results and those obtained from the feed labels. There were significant variations in terms of ether extract percentages between values from the lab analysis and from those obtained from the manufacturers feed labels. The EE% from the laboratory analysis were quite lower compared to those indicated on the different commercial feed labels.

All the diets differed significantly (P<0.05) in terms of percentages (%) DM and crude protein. While the % DM of Diet A was the highest (P<0.05), the % DM of diet B was the lowest (P<0.05). The DM % of Diet C was significantly (P<0.05) higher

than that of diet D. The DM % of diets in this study was within the range (85 to 95%) for broiler diets (10).

The %CP for Diet D was significantly ($P<0.05$) the best while the CP % of Diet B was the poorest ($P<0.05$). The CP% of Diet B was significantly ($P<0.05$) better compared to that of Diet A. Younger birds require higher levels of protein for rapid growth and development (10). High-quality protein sources such as soybean meal, fish meal, and other poultry by-product meals are commonly used in broiler diets. The CP% for diets C (22.72%) and D (25.66%) are in consistent with the typical range for broiler diets.

The % CF of diets A and B were similar ($P>0.05$) but significantly higher than those of diets C and D. The CF% of diet C was significantly ($P<0.05$) higher than that of diet D. Broilers have a relatively low tolerance for dietary fiber, as it can reduce feed intake and nutrient absorption. The result for crude fiber content in the present study ranges from 4.37% to 5.33%. (11) observed optimal growth performance and nutrient digestibility when broiler birds were fed diets containing between 3.5 to 5.5 %CF.

The percentage ether extracts for diets C and D were similar ($P>0.05$) but significantly ($p<0.05$) lower than that of diet B. The %EE of diet A was significantly the lowest ($P<0.05$). The ether extract content of broiler diets can vary depending on the dietary energy density and the ingredients used. The ether extract content of the diets in this study ranges between 2.61 to 3.42%. A study by (12) found that broiler diets containing 4 to 5% ether extract resulted in optimal growth performance and nutrient utilization.

The ash % of diets A, B, and C were similar ($p>0.05$) but significantly ($p<0.05$) lower compared to that of diet D. Supplemental minerals (e.g. bone meal or limestone) are commonly added to broiler diets to ensure adequate intake (10). The ash content of the diets in this study ranges from 7.44 to 9.00%, which was relatively adequate compared to the typical range for broiler diets intake (10). (13) in their study, found that broiler diets containing between 5 to 6% ash resulted in optimal growth performance and nutrient digestibility.

The NFE % of diet A and B were similar ($P>0.05$) but significantly ($p<0.05$) higher than that of diet C and D. The percentage NFE of diet C was significantly the lowest ($p<0.05$). The NFE of the four commercial diets as obtained in the present study, were in the range of 58.72 to 63.70%. This is also within the range as recorded by (14) who found that broiler starter diets containing between 60 to 65% NFE resulted in optimal growth performance and nutrient utilization.

The ME for diets B, C, and D did not differ ($P>0.05$) but were significantly ($P<0.05$) higher than that of diet A. The M.E is the conventional measure of the available energy in the diet. The ME content of broiler feeds ranges from 2900 to 3200kcal/kg (10). The M.E content of the commercial diets in this study ranges from 3106.05 to 3,272.08 (kcal/kg) which were in line with the (10) recommended values.

Conclusion and Application

The result of the proximate composition of the four commercial broiler diets from the laboratory studies showed that:

i. Only commercial broiler starter diets C and D had adequate crude protein percentage that could meet the protein requirement of broiler starter birds to support adequate growth performance.
ii. The crude fibre percentage of the commercial diets C and D were significantly lower than those of Diets

A and B signifying that with their ME (kcal/kg), they could be better digested and utilized than diets A and B.

iii. This study suggest that proximate quality of commercial broiler starter diets C and D are good enough to support adequate growth performance in broiler starter chickens.

Acknowledgement

The authors wish to thank Dr Aminu Bala of the Pasture Production Programme, who carried out the statistical data analysis.

References

1. Chellapandian, M (2019). Feed quality. A tool to monitor Animal Nutrition. *International Journal of Science, Environment and Technology*. 8 (2), 391-395
2. Shurson, G. C., Kerr, B. J. and Hanson, A. R. (2015). Evaluating the quality of feed fats and oils and their effects on pig growth performance. *Journal of Animal Science and Biotechnology.6 (10)*. https://doi.org/10.1186/s40104-015-0005-4
3. Makkar, H.P.S. and Beever, D. (2013).Optimization of feed use efficiency I ruminant production systems. Proceedings of the FAO symposium, 27th November, 2012, Bangkok, Thailand. FAO Animal Production and Health Proceedings, NO. 16, Rome, FAO and Asian-Eurasian Association of Animal Production Societies.
4. Carew, S.N., Oluremi, O.I.A. and Wambutda, E.P. (2005). The quality of Commercial Poultry feeds in Nigeria. A case study in Makurdi, Benue State. *Nigerian Veterinary Journal*.26 (1). 47-50
5. Oyinkansola, O.O. and Sema, Y.F. (2019). Feed Evaluation methods: Performance, Economy and Environment. *Eurasia Journal of Agricultural Research*. 3 (2).48-57.
6. Avimaps, (2015). Ovi location map; Ovi earth imagery July 30th 2015
7. A.O.A.C. (2005): Official Methods of Analysis, Association of Analytical Chemists. 15th Edition, Arlington, Virginia, USA.Pp200-210.
8. Pauzenga, U. (1985). Feeding parent stock Zootecnica International, pp. 22-24
9. Duncan, D.B. (1995). New Multiple ranges and Multiple F-Test. Biometrics 11:1-14
10. NRC (National Research Council), (1994): Nutrient Requirements of Poultry.9th ed. National Academy Press, Washington.
11. Sharifi, S. D., Toghyani, M., Shams Shargh, M., Gheisari, A. and Toghyani, M. (2022). Effects of dietary fiber sources on performance, nutrient digestibility, and intestinal morphology in broiler chickens. *Animal Feed Science and Technology*, 284, 114845.
12. Osman, A. O., Loh, T. C., Foo, H. L., Samsudin, A. A., Goh, Y. M., Abdul Rahim, R. and Mohamad, R. (2021). The effect of dietary fat levels and sources on growth performance, nutrient digestibility, and carcass characteristics of broiler chickens. *Poultry Science*, 100(5), 101-339
13. Alhassan, A. B., Aduku, A. O., Egwim, E. C., Isah, B. M. and Shaibu, G. T. (2022). Influence of different levels of ash on the performance, carcass yield, and blood chemistry of broiler chickens. *Poultry Science Journal*, 10(2), 183-191.

14. Aderinboye, R. Y., Olukosi, O. A., Oso, A. O., Ojebiyi, O. O., Oladele, S. B. and Ogunwole, O. A. (2022). Effect of dietary nitrogen-free extract on performance, nutrient retention and digestibility in broiler chickens. *Italian Journal of Animal Science,* 21(1), 1497-1506.