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Original Research Article

Proximate Analysis of Selected Commercial Broiler Feeds in Makurdi metropolis, North-Central Nigeria

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Abstract

Proximate analysis was carried out for some selected commercially available feed samples fed to broiler chickens in Makurdi metropolis. The results of the proximate analysis show the following composition: crude protein value ranged from 22.20 to 24.31% and from 19.46 to 22.19% for broiler starter and broiler finisher feed respectively, with significant differences (P<0.05) among all feed samples. Ether extract ranged from 5.60 to 9.18% and from 6.10 to 10.39% for broiler starter and broiler finisher feed respectively, with significant differences (P<0.01) across all the feed samples, crude fibre content in the starter and finisher feeds ranged from 5.27 to 8.20% and from 6.10 to 10.39% respectively, while ash content was found as 7.42 to 12.21% and from 7.31 to 12.76% for starter and finisher feeds respectively. NFE in starter feed ranged between 39.06 and 48.95% while in finisher feeds it ranged from 40.11 to 48.52%. The metabolizable energy values ranged from 2801.14 to 2951.70 Kcal/kg and 2824.30 to 3026.9 Kcal/kg for broiler starter and broiler finisher feed respectively, with significant differences (P<0.01) across all the feed samples. Commercial poultry feeds available in Makurdi, showed variations in their nutrient contents which were inconsistent with recommended baseline of the National Industrial Standard. It is concluded that frequent monitoring by competent National regulatory authorities are key to ensure feed standardization.

Keywords: Commercial feeds, broiler chicken, proximate composition, National Industrial Standard, Nigeria.

INTRODUCTION

Nutrition is the most important consideration in any livestock enterprise and its survival is dependent on the availability of feedstuffs, which are mainly components of human food (Esonu et al., 2006).

The main aim of rearing poultry is for the production of high quality protein in the form of meat or egg **from** broilers and layers respectively. Poultry is ranked the second worldwide eating meat constituting about 30% of meat production after beef which accounts for 38% (Raloff, 2003). Poultry is the fastest and cheapest means of bridging the protein deficiency gap prevailing in the country (Olomu, 1995; Attah, 2002). Broilers are fast growing birds with good feed conversion rate that can reach market weight at 6 – 8 weeks of age if properly kept and managed (Kekeocha, 1994; Olomu, 1995).

Oluremi et al. (2008) reported that feed represents the major cost of intensive poultry production in Nigeria and is estimated to represent more than 70% of the total cost of production. About 95% of it is used to meet energy and protein requirements, 3 – 4% for major and trace minerals and vitamin requirements, and the remaining 1 –

2% account for various feed additives needs of the chicken.

Availability of poultry feeds to farmers is constrained by the phenomenal rise in the cost of conventional ingredients due largely to competition between humans and livestock for available cereal and legume (Aduku and Olukosa, 1990; Emenalom, 2004). Farmers are constantly faced with challenges arising from poor and inconsistent quality of commercial feeds, insufficient knowledge of cost and nutritive value of commercial feeds, rising feed prices and limited capital (Tewe, 2003; Emenalom, 2004). There is therefore the need to regularly determine the quality of commercial feeds offered to farmers especially under poor regulatory climate that currently exists in the country.

The objective of this study therefore, was to determine the chemical contents of some selected broiler chicken feeds commercially available in Makurdi, Nigeria, using the proximate method.

MATERIALS AND METHODS

Location of study

The study was carried out in the Animal Nutrition Laboratory, Department of Animal Health and Production, College of Veterinary Medicine, Federal University of Agriculture, Makurdi, Nigeria.

Poultry feed sample collection

Four popular commercial brands of feeds sold to farmers in the study area were purposively selected and used for the study. In each case, the feed types used in feeding broiler chicken such as broiler starter (BS) and broiler finisher (BF) commercially were selected. The first brand was coded BS I and BF 1, the second as BS2 and BF2, the third as BS3 and BF3, while the fourth was coded as BS4 and BF4 for broiler starter and broiler finisher rations respectively.

Preparation of feeds samples

Feed samples were ground using mammonlex super blender millgrater3 (No:4A-0018, Type JW-001, Taiwan), sifted through a stainless steel screen having a mesh size of 1.0 mm to obtain a uniform particle size and kept in air tight bags until required for analysis (Mahesar et al,, 2010).

Analytical Method

For the proximate analysis of feeds, Association of Official Analytical Chemists recommended methods (AOAC, 2002) were used to determine the levels of moisture, crude fat, crude fibre, crude protein, total ash and nitrogen-free extract.

Statistical Analysis

Data were subjected to one-way analysis of variance (ANOVA) using the Minitab Statistical Software (2005). Where significant effects of the studied parameters were obtained, means were separated by the Least Significance Difference (LSD) method as outlined by Steel and Torrie (1980).

RESULTS

The results of the proximate analysis of the various feeds expressed on dry matter basis are shown in Tables 1 and 2. High dry matter content of 87% and above were obtained in all the feeds. The crude protein value ranged from 22.20 to 24.31% and from 19.46 to 22.19% for broiler starter and broiler finisher feed, respectively, with significant differences ($P<0.05$) being observed in all the feed samples. The ether extract in the diets ranged from 5.60 to 9.18% and from 4.60 to 10.33% for broiler starter and broiler finisher feed, respectively, with significant differences ($P<0.01$) being observed in all the feed samples. The crude fibre content in the broiler starter and broiler finisher was in the range of 5.27 to 8.20% and 6.10 to 10.39% for starter and finisher feeds, respectively. Significant differences ($P<0.01$) were observed for crude fibre and ash content in all the feed samples.

Significant differences ($P<0.01$) were also observed for starter and finisher feeds for NFE which ranged from 40.11 to 48.52% and from 39.06 to 48.15% respectively. The metabolizable energy values ranged from 2801.14 to 2991.15 Kcal/kg and from 2824.30 to 3026.90 Kcal/kg for starter and finisher respectively with significant difference ($P<0.01$) across all the feed samples.

DISCUSSION

Protein is a vital nutrient in poultry and other classes of animals. By virtue of its amino acid constituents, protein plays a significant role in growth, egg production, immunity, adaptation to the environment and in many other biological functions (Poultry World, 2016). It is a major constituent and cost component of the feed (Kaushalendra et al., 2016). The minimum requirements of crude protein by the National Industrial Standard (1989) for broiler starter and broiler finisher ration were respectively cited as 24% and 20%. Generally, starter rations are high in crude protein whereas finisher rations

Table 1. Proximate composition of the commercial diet for broiler starter (%DM)

	Commercial diets				
Nutrients	**BS1**	**BS2**	**BS3**	**BS4**	**SEM**
Dry matter (DM)	90.24^{a}	86.91^{b}	90.33^{a}	89.19^{a}	0.02*
Crude protein (CP	24.16^{a}	23.83^{a}	22.20^{b}	24.31^{a}	0.13*
Crude Fibre (CF)	5.27^{c}	6.29^{b}	6.07^{b}	8.20^{a}	0.13**
Ether extract (EE)	5.60^{bc}	5.80^{bc}	6.37^{b}	9.18^{a}	0.16**
Ash	12.21^{a}	8.95^{b}	7.42^{c}	7.28^{c}	0.01**
Nitrogen free extract(NFE)	43.08^{b}	42.04^{b}	48.52^{a}	40.11^{c}	0.24**
^{1}ME	2801.14^{b}	2840.10^{b}	2991.15^{a}	2951.70^{a}	0.45**

^{1}Metabolizable Energy Kcal/Kg = 10 [(3.5xCP) + (8.5xCF) + (3.5 x NFE)] (Bukar and Saeed, 2015)
*(P<0.05), **(P<0.01)
^{abcd} Means in the row with different superscripts are significantly different.
SEM = Standard Error of Mean

Table 2. Proximate composition of commercial diets for broiler finisher

	Commercial diets				
Nutrients	**BF1**	**BF2**	**BF3**	**BF4**	**SEM**
Dry matter (DM)	89.37^{ab}	87.82^{b}	90.36^{a}	89.28^{ab}	0.014*
Crude protein (CP	19.46^{b}	21.51^{a}	20.61^{b}	22.19^{a}	0.15*
Crude Fibre (CF)	6.10^{c}	7.02^{b}	6.93^{b}	10.39^{a}	0.09**
Ether extract (EE)	4.60^{b}	4.65^{b}	5.63^{b}	10.33^{a}	0.05**
Ash	12.76^{a}	10.90^{b}	8.25^{c}	7.31^{c}	0.02**
Nitrogen free extract (NFE)	46.42^{b}	43.74^{c}	48.95^{a}	39.06^{d}	0.20**
$_{1}$ME (Kcal/Kg)	2824.30^{c}	2880.50^{b}	3023.65^{a}	3026.90^{a}	0.27**

^{1}Metabolizable Energy Kcal/Kg = 10 [(3.5xCP) + (8.5xCF) + (3.5 x NFE)] (Bukar and Saeed, 2015)
*(P<0.05), **(P<0.01)
^{a,b,c,d} Means in the same row with different superscripts are significantly different.
SEM = Standard Error of Mean

contain less protein because older birds need less.

The proximate composition of the broiler starter diets in this study showed that BS1, BS2 and BS4 met the 24% protein requirement (NIS, 1989), while diet BS3 did not meet the recommended minimum requirement. In finisher diets, BF2, BF3 and BF4 met the protein requirement of 20% (NIS, 1989) while BF1 was slightly below the recommended minimum requirement.

The crude fibre levels of the feeds analysed in this study were higher than the NIS (1989) recommendation for broiler chickens. The NIS (1989) recommends a maximum level of 5% crude fibre for both broiler starter and finisher rations. BS4 and BF4 were particular high at 8.20% and 10.39% respectively. The higher levels found in this study may affect growth of birds. The crude fibre represents the non-starch carbohydrate fraction of the feeds.

Fat in poultry diet improves the absorption of fat soluble vitamins and increases palatability of feed (Velmurugu, 2012; Baiao and Lara, 2005). With the exception of BF1 and BF2 having recorded a lower fat content lower than the maximum of 5% as expected by the NIS (1989), the rest of the feed samples had higher fat content than recommended as shown in Tables 1 and 2. The study revealed that BS4 and BF4 had the highest mean fat content of 9.18% and 10.33% respectively. Fat component of poultry feed helps to increase overall energy concentration and in turn productivity and feed efficiency (NRC, 1994).

The ash component of the feed represents the inorganic content and is mainly minerals. These are critical nutrients required in specific amounts in poultry diets for stronger bone, blood clothing, enzymes activation, muscle contraction and for egg shell formation (Jacquie, 2018). Ofori et al.(2019) reported that a low ash content of the feed pre-disposes birds to diseases and poor egg shell formation. There was variability among the mean ash content of the feed samples at P<0.01.

Metabolizable energy (ME) refers to the energy which

the poultry utilizes. Table 1 shows that broiler starter BS3 had the highest mean ME of 2991.15 Kcal/Kg which is slightly lower than the NIS (1989) recommendation of 3000Kcal/Kg for broiler starter ration. The rest of the feed samples fell below the recommended ME content for starter diets. Table 2 shows that broiler finisher BF3 and BF4 met the NIS (1989) recommendation for broiler finisher rations. The BF1 and BF2 diets contained lower ME levels than the NIS (1989) recommendation.

CONCLUSION AND RECOMMENDATIONS

Commercial feeds available in Makurdi Metropolis showed remarkable fluctuation in the proximate analysis of the feed samples from selected manufacturers. There were significant variations among the various means of the feed samples at $P<0.01$. Most of the feed samples differed from mean recommended values by the National Industrial Standard. To ensure quality and standardization of feeds that meet the nutritional requirements for good health and performance of birds, frequent monitoring and enforcement of standards by appropriate government regulatory agencies is recommended.

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