THE PROXIMATE COMPOSITIONS OF DRIED GROUNDNUT HUSK MEAL FED TO BROILER CHICKENS

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ABSTRACT

The proximate composition of dried groundnut husk meal (DGHM) was evaluated using standard procedures. The result for the proximate composition showed the moisture content (7%), dry matter (93%), ash (4.2%), Crude fibre (37.8%), Crude protein (7.5%), Ether extract (1.31%), carbohydrate (49.19) and calorie value of 2129.68kcal/kg. Birds were fed 5 treatments (T); T1 (0% DGHM), T2 (5% DGHM), T3 (10% DGHM), T4 (15% DGHM) and T5 (20% DGHM). Dry matter, moisture, energy and ash were not significantly different (P>0.05) across all the treatments. Crude protein in T4 (21.54%) was significantly (P<0.05) lower than T1 (25.27%), T2 (23.94%), T3 (24.62%) and T5 (24.96%). Ether extract increased significantly (P<0.05) on T5 (5.50%) while carbohydrate decreased significantly (P>0.05) on the same treatment T5 (47.98%). The control diet (6.22%) and T2 (6.84%) were significantly higher (P<0.05) than T3 (7.92%), T4 (7.73%) and T5 (7.99%) for crude fibre. The results showed that dried groundnut husk meal contains essential and valuable nutrients that are beneficial to broiler diets and can also solve waste disposal problem by turning waste into wealth.

Keywords: dried groundnut husk meal, broiler chickens, nutritional analysis, feed formulation, alternative feed ingredients

INTRODUCTION

Feed is one of the most critical components in poultry production; it accounts for about 70 - 80% of the cost during poultry rearing (Samuel *et al*., 2015). Aside from cost, its quality and balanced mix of nutrients directly affect the growth, health, and productivity of birds regardless of their genetic potential (Zampiga *et al*., 2021). Therefore, feed must contain essential nutrients like carbohydrates, proteins and amino acids, fats, vitamins, and minerals in their proper proportions to meet the physiological needs of the birds (broiler or layer) at different stages of their growth (NRC, 1994).Most poultry farmers in Nigeria depend on commercial feeds for their poultry farms, but with the recent increase in feed prices, farmers are struggling to cope (Abdulrahman *et al*., 2022). On the other hand, manufacturers are affected by the unavailability of macro ingredients, like maize and soybeans, which has made them fail to meet the required standards for poultry feeds. Hence, there is a need for alternative feeding materials that are cheap and can meet the nutrient requirements of birds.

The search for alternative feed materials or non-conventional, locally available agricultural by-products, such as cottonseed meal, cocoyam peel meal, dried cabbage meal and groundnut husk meal, is important for economic sustainability and can potentially reduce the heavy burden of feed costs on farmers and keep the environment clean (Ilaboya and Imouokhome, 2023). Groundnut belongs to the *Arachis hypogaea* family; it is produced in large quantities in Nigeria. The husk is the fibrous outer shell of peanuts, a by-product of groundnut processing, and it is usually discarded after consumption of its seed. However, in recent times, studies have shown that it contains some nutritional potential and can serve as a feed ingredient. Groundnut husk meal (GHM) is high in fibre and has moderate levels of essential minerals, making it a viable alternative for partially replacing conventional feed ingredients like maize and wheat bran in broiler diets (Abdulrazak *et al*., 2014; Alaba *et al*., 2015). The proximate composition of dried groundnut husk was evaluated in this study to raise awareness among poultry farmers and feed manufacturers about the nutrients that are inherent in this agricultural by-product that can serve as a useful tool for nutritionists to formulate balanced diets for broiler chickens.

MATERIALS AND METHODS

Samples of dried groundnut husk were washed with clean water to remove dirt and other contaminants. The samples were sun-dried, ground into powder, and stored in an air-tight container for analysis. The grounded husk meal was then incorporated in graded levels at the expense of maize in the experimental diets as follows: Diet one was the control with (0% DGHM), diets 2, 3, 4, and 5 had (5 % DGHM, 10% DGHM, 15% DGHM, and 20% DGHM respectively). The gross compositions of the experimental diets are presented in Table 1. A ninety (90) day-old Ross 308 strain were randomly divided into five (5) groups of eighteen (18) birds each and replicated three (3) times with six (6) chicks per replicate in a completely randomized design. The experiment lasted forty-six (46)

days, during which a light source was provided; sunlight during the day, and electrical bulbs were used at night. Drugs, vaccinations, and other routine management practices were strictly followed according to the manufacturers' and veterinary recommendations.

Crude Fibre

A sample weighing two grams, which was free of moisture and fat, was subjected to digestion with acid (1.25% H_2SO_4) and alkali (NaOH) for 30 minutes. The contents were then dried in a hot air oven at 100 °C until a constant weight was achieved. The dried residue was ignited in a muffle furnace at 550 °C for 20 minutes. The loss in weight during this process was reported as crude fibre.

$$\text{Crude fibre} = \frac{\text{Loss in weight on ignition} \times 100}{\text{weight of sample}}$$

Ether Extract

The ether extract was obtained by performing extraction with petroleum ether (PE) using a Soxhlet system, which operates within a boiling point range of 40–60°C. The extraction process involved using 25 ml of PE and 1 g of the dried sample, conducted for 3 to 4 hours. After extraction, the petroleum ether was evaporated at 105 ˚C until dry. The percentage of crude fat was determined by calculating the weight of the residue based on the dry weight of the sample.

$$\text{Ether extract} = \frac{W2 - W1}{W3} \times 100$$

Where W1 = weight of empty flask; W2 = Weight of flask + fat; W3 = weight of sample taken.

Moisture Content

The 5gm of the sample was placed in a hot air oven at 80˚C up to constant weight, and the moisture percentage was recorded.

$$\text{Moisture \%} = \frac{\text{Weight of fresh sample} - \text{Weight of the dried sample}}{\text{Weight of fresh sample}} \times 100$$

Ash

The 10-gram sample was placed in a crucible and kept in a muffle furnace at 550°C for 6 hours, then desiccated and weighed.

$$\text{Ash \%} = \frac{\text{Weight of sample after ashing}}{\text{Total weight of the sample}} \times 100$$

Table 1: Gross composition of broiler finisher diet

Ingredients	T1 (control)	T2 (5%DGHM)	T3 (10%DGHM)	T4 (15%DGHM)	T5 (20%DGHM)
Maize	55.10	52.34	49.59	46.85	44.08
Dried Groundnut Husk Meal	0.00	2.76	5.51	8.25	11.02
Wheat offal	4.50	3.70	3.70	3.70	3.70
Fish meal	11.50	11.50	11.50	11.50	11.50
Soya Oil	10.00	10.00	10.00	10.00	10.00
Soybean meal	15.00	15.00	15.00	15.00	15.00
Vit. Premix	0.20	0.20	0.20	0.20	0.20
Limestone	0.20	0.10	0.10	0.10	0.10
Dicalcium phosphate	0.25	0.15	0.15	0.15	0.15
Hemicellulose	0.00	1.00	1.00	1.00	1.00
Titanium dioxide	2.50	2.50	2.50	2.50	2.50
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated Nutrients					
ME Kcal/Kg	3181.10	3133.00	3103.57	3104.24	3104.59
Crude Protein (%)	20.98	20.97	20.90	20.83	20.77
Ash (%)	3.83	3.87	3.95	4.03	4.11
Crude Fibre (%)	3.06	3.95	4.92	5.88	6.85
Ether Extract (%)	3.84	3.72	3.65	3.57	3.50
Nitrogen Free Extract	68.08	67.49	66.59	65.69	64.78

[1]*Composition of vitamin premix per kg of diet: vitamin A, 12500 I.U; vitamin E, 40mg; vitamin K, 2mg; vitamin B1, 3mg; vitamin B2, 5.5mg; niacin, 5.5mg; calcium pantothenate, 11.5mg; vitamin B6, 5mg; vitamin B12, 0.025mg; choline chloride, 500mg, folic acid,1mg; biotin, 0.08mg; manganese, 120mg; iron 100mg; zinc, 80mg; copper, 8.5mg; iodine, 1.5mg; cobalt, 0.3mg; selenium, 0.12mg, anti-oxidant, 120mg,*

Crude Protein

Dried groundnut husk samples were digested with a catalyst composed of hydrogen sulphate (H_2SO_4) and potassium sulphate (K_2SO_4) using concentrated sulphuric acid until the mixture became clear. After digestion, the material was cooled and diluted with distilled water. An aliquot of the solution was then transferred to a Kjeldahl distillation apparatus for distillation, using a 40% sodium hydroxide (NaOH) solution and zinc dust. The ammonia generated during this process was captured using a 2% boric acid solution that contained an indicator. The resulting distillate was titrated to a light pink colour using 0.1 N sulfuric acid. The percentage of nitrogen was calculated using the following formula;

Nitrogen %= ml 0.1 N H_2SO_4 x $\frac{0.0014}{W1 \times 10}$ × 250 × 100

Where Conversion factor = 100/N (N% in fruit products).

Chemical and Statistical Analysis

The proximate composition, which includes moisture, crude protein, crude fat, ash, and carbohydrate, was determined in triplicate according to standard procedure (AOAC, 1990). Samples of the experimental diet of DGHM were analysed for its proximate compositions. The collected data were analysed following the completely randomized design using SAS software.

RESULTS AND DISCUSSION

The result of the proximate composition among the different treatments (Table 2) shows that the moisture, metabolizable energy (ME), and ash were not significantly (P>0.05) different among the treatments. However, in crude protein (CP), there was a significant (P<0.05) difference in T4 (21.54%), which had the lowest value among the different treatments. In crude fibre (CF), there is significant (P<0.05) difference among the treatments, with T1 (6.22%) having the lowest value, followed by T2 (6.84%). For crude fibre (CF), T3 (7.92%), T4 (7.73%), and T5 (7.99%), showed no significant (P>0.05) difference across the three treatments. Significant differences were observed in crude fat (P<0.05) in T5 (5.50%), which has the highest value. At the same time, there is no significant (P>0.05) difference in crude fat across the other treatments; T1 (3.13%), T2 (3.16%), T3 (3.04%) and T4 (3.49%). The carbohydrate level (Nitrogen-free extract (NFE)), exhibited no significance (P>0.05) within T1 (52.60%), T2 (52.41%), T3 (50.19%), and T4 (53.30%), but there is a significant (P<0.05) difference in T5 (47.98%) which has the least value. The presence of these essential nutrients and minerals imply groundnut husks could be utilized as a feed ingredient for poultry and domestic animal. Minerals are essential nutrients, which are said to be present in small amounts in the body or in several parts per million (Gafar and Itodo, 2011).

Table 2. Proximate composition of dried groundnut husk supplemented with hemicellulase and organic acid on the broiler finisher

Parameters	T1 (control)	T2 (5%DGH)	T3 (10%DGH)	T4 (15%DGH)	T5 (20%DGH)	SEM
Dry matter (%)	93.40	92.81	92.08	92.38	92.60	0.17
Moisture (%)	6.60	7.19	7.92	7.62	7.40	0.17
ME (Kcal/kg)	3031.64	2978.17	2916.35	2948.11	3052.40	17.29
Crude Protein (%)	25.27[a]	23.94[a]	24.62[a]	21.54[b]	24.96[a]	0.43
Ash (%)	6.13	6.47	6.31	6.25	6.17	0.07
Crude Fibre (%)	6.22[a]	6.84[b]	7.92[c]	7.73[c]	7.99[c]	0.19
Crude Fat (%)	3.13[a]	3.16[a]	3.04[a]	3.49[a]	5.50[b]	0.27
Nitrogen Free Extract	52.60[a]	52.41[a]	50.19[a]	53.30[a]	47.98[b]	0.60

DGHM = Dried Groundnut Husk Meal

The results of the proximate composition of the DGHM indicated that crude protein (7.50%) is comparable to the research of Ibude *et al*. (2021) and Eshag *et al.* (2015) and which was reported to be 6.94% and 8.40% respectively. Also, the ether extract of DGHM (1.31%) is slightly lower compared with the result of Adeyina *et al*. (2019) and Alaba *et al.* (2015), which is 3.25% and 3.50% respectively. This difference could stem from differences in groundnut processing, geographical location, method of processing, and extraction techniques. The crude fibre content (37.80%) is significantly reduced compared to the research of Eshag *et al.* (2015), which is 51.2%. This significant reduction in crude fibre content could enhance digestibility in broiler diets. However, it is still relatively high, hence the need for exogenous enzymes to break down the fibre.The result of carbohydrates (2129.68 Kcal/kg) is similar to the research of Millam *et al.* (2022), which was 2177.10 Kcal/kg. This similarity suggests that DGHM could provide a reasonable energy contribution to poultry diets; though it is still relatively lower compared to maize, it can serve as an alternative energy feed ingredient. The ash content of DGHM (4.20%) agrees with the

result of Alaba *et al*. (2015), which is 3.50%. The ash content suggests a significant presence of essential minerals such as calcium, magnesium, potassium, and phosphorus, which are critical for various physiological functions in birds. The moisture, ash, and crude fibre content of the two samples indicate that they can be easily dried so that they could easily burn off when used as a source of heat (Jekayinfa and Omisakin, 2005).The dry matter content of DGHM (93%) agrees with the result of Babalola *et al*. (2023), which is 89.28%.

CONCLUSION

Based on the result obtained from proximate analysis, it is recommended to include groundnut husk meal (DGHM) up to 20% as a partial replacement of maize grain in the diet of broiler chicken. It is envisaged that the usability of dried groundnut husk meal as agricultural feed would solve a waste disposal problem, reduce the competition between humans and animals for grains, as well as reducing the cost of production and help in turning the waste around us for wealth.

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