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APPARENT NUTRIENT RETENTION AND HAEMATOLOGICAL INDICES OF BROILER FINISHERS FED LABLAB SEED MEAL

Y. A. Bashar[1], H. M. Tukur[1], A. A. Sekoni[2] and W. A. Hassan[1]

[1]Department of Animal Science, Usmanu Danfodiyo University, Sokoto
[2]National Animal Production Research Institute, Shika, Ahmadu Bello University, Zaria

ABSTRACT

Studies were carried out to investigate the effect of feeding diets containing lablab seed meal (LSM) in place of groundnut cake (GNC) or full fat soya (FFS) as the major source of protein on apparent nutrient retention and haematological parameters of broilers at the finisher phase. Dry matter retention was highest ($P<0.05$) for birds fed GNC, which had the lowest ($P<0.05$) crude protein, nitrogen free extract and calcium retentions. Birds fed LSM had the lowest ($P<0.05$) retention of magnessium and phosphorus. Mean corpuscular volume (MCV) (fl) was lowest ($P<0.05$) for broiler finishers fed GNC, while neutrophils (%), lymphocytes (%) and monophils (%) were lowest ($P<0.05$) for those fed diets containing LSM. All values were however within the normal ranges for broilers. The results indicate that LSM could replace GNC and FFS in the diets of broilers at the finisher phase without compromising performance.

Key words: Broiler finishers; Nutrient retention, Haematological parameters, Lablab seed meal.

INTRODUCTION

Feedstuffs such as soyabeans and groundnut cake used in compounding diets for poultry are also in high demand for human consumption and industrial uses (Anike and Okeke, 2003). This has made them become more expensive, thereby increasing the cost of poultry production. Therefore, alternative feeding stuffs must be sourced. However, the use of some alternative plant protein sources is limited by their content of antinutritional factors, which include trypsin, chymotrypsin and amylase inhibitors; afflatoxins and polyphenolic compounds, which tend to inhibit and obstruct the activity of digestive enzymes, causing digestive losses (Sarwatt *et al*., 1991).

Lablab purpureus (L) Sweet, also known as Dolichos lablab, Egyptian bean, Lablab bean, Bonavist or Hyacinth bean (Hendricksen and Minson, 1985) and "*Danwar*i" in Hausa language is well grown by farmers in Sokoto and its environs. As a result of its high grain yield of up to 3t/ha, which compares favourably with the yield of soyabeans (2 to 7 t/ha) (Wood, 1983), a lot of seeds are produced, which could be exploited by poultry farmers. Unlike groundnuts and soyabeans, lablab seeds have not been widely used in poultry diet

formulations, despite the fact that it is cheaper than most plant protein sources in the Sub-Saharan zone of Nigeria. This is because it is not widely consumed as food and does not have industrial applications.

Sarwatt *et al*. (1991) fed broilers with lablab seed meal (LSM) and obtained favourable results in terms of weight gain, feed intake, feed conversion ratio and dressing percentage. Similarly, Ogundipe *et al*. (2003) reported favourable weight gains in pullets fed diets in which lablab seed meal constituted 50%. This implies that LSM contains nutrients that are utilizable by poultry for overall gain.

This study aims at evaluating the inclussion of LSM in the diets of broilers at the finisher phase. The objectives of the study are to determine the level of nutrients retention and impact on haematological indices of broiler finishers fed diets containing LSM as the major source of protein, compared to groundnut cake and full fat soya.

MATERIALS AND METHODS

Experimental Site

The experiment was conducted at the Sokoto State Veterinary Center, located at Aliyu Jodi road in Sokoto metropolis. Sokoto is located on latitude 13º4' N and longitude 5º13' E, in northwestern Nigeria (Fullard, 1973; Reuben, 1981). Sokoto State is situated in the savannah vegetation zone of Nigeria with a semi arid climate, boardering with Niger Republic to the north, Zamfara State to the east and Kebbi State to the southwest, occupying a land area of 26,648 square kilometers (Adamu, 1992).

Full Fat Soya and Lablab Seed Meals

Soya bean and lablab seeds were soaked in cold water for about 20hrs and later boiled for between 30 and 40 minutes according to the methods of Ogundipe *et al*. (2003). The boiled water was decanted and the boiled seeds were dried in open air for five days. After drying, the seeds were ground into meal.

Experimental Procedure

Two hundred and thirty four day-old broilers of the Anak strain were divided into nine groups of twenty-six chicks, each representing a replicate. Three replicates (i.e. 78 birds), consisting of a treatment, were randomly assignmed to one of the following dietary treatments: Diets 1, 2 and 3 containing GNC, FFS and LSM as the major source of protein, respectively. The diets were formulated to contain an average of 2975 (kcal/kg) ME and 20% CP, according to the recommendations of NRC (1977). The diets were fed for four weeks, from the 5^{th} week to the 8^{th} week of age. The gross and chemical composition of the diets fed to experimental birds is shown in Table 1.

At the eighth week of age, three chicks from each replicate were transferred to clean metabolic cages and fed the corresponding treatment diets. Feed was offered at 90% of the average daily feed intake (Oluyemi and Roberts, 2000). Feed and water were served early morning between 7.00am and 8.00am. The trial lasted for six days. The first three days were considered as adaptation period and the last three days as experimental period. Records of feed intake and faeces voided were taken during the last three days. Feed and faecal samples were weighed and oven dried in the laboratory. The samples were later analyzed for proximate composition according to the methods of AOAC (2000). Calcium

was analyzed by EDTA titration method. The Bray Number 1 method was used to determine phosphorus, while sodium and potassium contents were determined by the flame photometric method. Apparent nutrient retention was later calculated using the formula below (Oluyemi and Roberts, 2000):

$$\text{Apparent nutrient retention} = \frac{\text{Nutrient intake} - \text{Nutrient in excreta}}{\text{Nutrient intake}} \times 100$$

Haematological Analysis

At the end of the eighth week, three birds from each replicate were fasted over night. Blood samples were collected through the jugular vein. The samples were collected in Ethylene Diamine Tetra Acetic Acid (EDTA) treated bottles for determination of packed cell volume (PCV); red blood cell (RBC) and white blood cell (WBC) counts and haemoglobin concentration (Hb), at the Usmanu Danfodiyo University Veterinary Teaching Hospital. Mean cell haemoglobin concentration (MCHC) and mean cell haemoglobin (MCH) were later calculated according to the methods of Jain (1986).

Statistical Analysis

Data generated during the study were subjected to analysis of variance in a completely randomized design using the general linear model programme of the SPSS Computer Package (SPSS, 1999).

RESULTS

Apparent Nutrient Retention

Results of the apparent nutrient retention are presented in Table 2. Dry matter retention was similar ($P>0.05$) between birds on the FFS and LSM diets (73%), but significantly different ($P<0.05$) from those fed the GNC diet (74%). Retentions of crude protein were higher ($P<0.05$) for birds fed the FFS (73%) and LSM (72%) diets than those fed the GNC diet (67%). There were no significant differences between treatments in the retention of crude fibre, ether extract and ash. Crude fibre retention varied from 48% for birds on the GNC diet to 52% for those on the LSM diet. Retention of ether extract varied from 85% for birds on the GNC diet to 92% for those on the FFS diet. Ash retention was also similar ($P<0.05$) across the treatments (Table 2).

There was a significant variation ($P<0.05$) in the retention of nitrogen free extract (NFE) between birds on the GNC diet (58%) and those on the LSM diet (68%). These values did not however differ significantly from those of birds fed the FFS diet (63%). Retention of calcium, phosphorus and magnesium varied between treatments.

Calcium retention was highest ($P<0.05$) for birds on the FFS (84%) and LSM (82%) diets compared to those on the GNC diet (77%). However, phosphorus retention was lower ($P<0.05$) for birds fed GNC and LSM (93%) diets than those fed the FFS diet (96%).

Table 1: Gross and chemical composition of experimental diets containing GNC, FFS or LSM.

Ingredients (%)	Diet 1 (GNC)	Diet 2 (FFS)	Diet 3 (LSM)
Maize	57.55	48.05	33.00
GNC	26.00	0	0
FFS	0	28.00	0
LSM	0	0	50.00
Rice bran	9.00	13.50	7.00
Blood meal	2.00	2.5	4.00
Limestone	1.50	3.00	1.00
Bone meal	3.00	4.00	2.00
Vit. /Min. Premix*	0.25	0.25	0.25
Salt	0.30	0.30	0.30
Methionine	0.20	0.20	0.20
Lysine	0.20	0.20	0.20
Vegetable oil	0	0	2.05
Total	100	100	100
Calculated chemical composition			
ME (kcal/kg)	2977.07	2975.39	2955.17
Crude protein (%)	20.14	20.19	20.29
Crude fibre (%)	3.59	4.21	3.83
Ether extract (%)	5.02	8.69	5.26
Calcium (%)	1.70	2.60	1.14
Available Phosphorus (%)	0.59	0.85	0.59
Methionine (%)	0.47	0.52	0.34
Lysine (%)	1.04	1.26	0.86
Cost per kg (N)**	32.88	47.31	35.88

* Vitamin A, 1000 I.U; Vitamin D, 3000 I.U; Vitamin E, 8.0 I.U; Vitamin K, 2.0mg; Vitamin B1,2.0mg; Vitamin B6, 1.2mg, Vitamin B12, 0.12mg; niacin, 1.0mg; Panthothenic acid, 7.0mg; Mg, 1000mg; Cu, 8.0mg; Co, 0.45mg; and Se, 0.1mg per kg of diet.

** Based on price of ingredients at Sokoto central market between January and December, 2004.

Magnesium retention was higher for broilers fed the GNC and FFS diets (96%) compared to those fed the LSM diet (93%) ($P<0.05$). Sodium retention ranged between 94-95% across the treatments. Potassium retention varied between 90-95%. These parameters did not differ significantly between the treatments.

Table 2. Apparent nutrient retention (%) of experimental birds (5-8 weeks of age).

Parameters	Diet 1 (GNC)	Diet 2 (FFS)	Diet 3 (LSM)	SEM
Dry matter	74.28[a]	73.09[b]	72.88[b]	0.32
Crude protein	66.67[b]	73.00[a]	72.50[a]	1.48
Crude fibre	47.67	48.67	51.67	2.33
Ether extract	85.33	92.33	89.33	2.24
Ash	73.00	72.33	69.00	1.38
NFE	58.00[b]	63.00[ab]	68.00[a]	2.21
Calcium	76.67[b]	84.00[a]	82.00[a]	1.54
Phosphorus	93.33[b]	96.00[a]	92.67[b]	0.69
Magnesium	95.67[a]	96.00[a]	92.67[b]	0.79
Sodium	94.33	94.67	93.67	0.75
Potassium	93.67	89.67	95.00	1.75

Means in a row followed by same letter (s) in superscript are not significantly different (P>0.05).

Haematological Parameters

Result of blood analysis to find the impact of the dietary treatments on blood parameters at the finisher phase is shown in Table 3. PCV (%), RBC (10^4 ml), WBC (10^6ml) and Hb (g/100ml) contents varied from 29-35, 2.6-2.9, 28-29 and 8.6-9.1, respectively, across the treatments. The differences were not significant. However, MCV was higher for birds fed the FFS and LSM containing diets (120 and 127fl respectively), compared to those fed the GNC diet (106fl). MCH varied from 31-33 across the treatments, with no significant differences. The variation in MCHC between the treatments (26-29%) was also not significant.

Levels of neutrophils were higher (P<0.05) in the GNC and FFS containing diets (35 and 38%, respectively) copared to the LSM containing diet (31%). Similarly, lymphocytes and monophils levels were higher (P<0.05) in the GNC and FFS diets (63 and 8%, respectively) compared to the LSM diet (58 and 6% respectively). Levels of eosinophils varied between 4% for the LSM diet to 5% for the FFS diet, with no significant differences between the treatments (P>0.05). Basophils were not detected in the blood of the experimental animals.

DISCUSSION

The similar crude protein digestibility values for the FFS and LSM diets may be due to similarity in the physical features of these two protein sources -i.e whole seed was offered instead of oil extracted cake as in the case of the GNC. Crude protein retention values obtained in this study were higher than the values (62.1 to 63%) obtained by Ahmed and Olorede (2004) and lower than those (75.4 to 85%) reported by Bamgbose *et al*. (2004). Lower crude protein retention by broilers fed the GNC diet could be attributed to the poor digestibility of groundnut cake as compared to full fat soya and lablab seed meals (Olomu, 1995).

Table 3. Haematological indices of broilers at the finisher stage

Parameters	Diet 1 (GNC)	Diet 2 (FFS)	Diet 3 (LSM)	SEM
PCV (%)	29.67	35.00	33.33	1.55
RBC ($10^4\mu$ l)	2.79	2.91	2.62	0.10
WBC ($10^6\mu$ l)	27.53	29.12	28.14	0.76
Hb (g/100ml)	8.57	9.07	8.57	0.34
MCV (fl)	106.29[b]	120.15[a]	127.27[a]	2.69
MCH (%)	30.72	31.14	33.05	1.96
MCHC (%)	28.90	25.92	26.06	1.76
Neutrophils (%)	34.67[a]	37.67[a]	30.67[b]	1.00
Lymphocytes (%)	63.00[a]	63.00[a]	58.00[b]	1.41
Monophils (%)	8.00[a]	8.33[a]	6.00[b]	0.51
Eosinophiles (%)	4.67	5.33	3.67	0.58
Basophiles (%)	0	0	0	0.00

Means in a row followed by same letter (s) in superscript are not significantly different (P>0.05).

Crude fibre retention values obtained in this study were similar to the range of 46.2 to 53.4% obtained by Nworgu and Egbunike (1999) when they fed groundnut cake and full fat soya based diets to broiler finishers. Values obtained for the present study were higher than the range of 25.9 to 32.2% reported by Afolayan (2004) and lower than the range of 51 to 65% obtained by Bamgbose *et al.* (2004) during a feeding trial in which maize offal and cashew nuts based diets were fed to broilers at the finisher stage, respectively. Low digestibility of crude fibre may be due to its high content of cellulotic polysaccharides whose glycosidic bonds are not hydrolysable by monogastric enzymes (Olomu, 1995).

Ether extract retention values obtained in this study were higher than the values reported by Ahmed and Olorede (2004) (62.6 to 73.9%) and Bamgbose *et al*. (2004) (80.4 to 80.9%) They were, however, similar to the values obtained by Afolayan (2004) (99.6 to 99.9%). Monogastrics generally can effectively digest and assimilate the ether extract components of feed ingredients (Olomu, 1995).

PCV values obtained from this study were within the normal ranges of 22 to 35% reported by Jain (1993), and 25 to 45% reported by Mirtuka and Rawnsley (1997). RBC values were also similar though on the lower side to the range of $2.0x10^6$ to 4.0×10^6 mm outlined by Mirtuka and Rawnsley (1997) and the value of 2.19×10^6 mm obtained by Simarak *et al*. (2004). Values for WBC and Hb obtained from analysis of the blood of broilers in this study were within the normal values found in healthy broilers as reported by Jain (1993), Mirtuka and Rawnsley (1997) and Simarak *et al*. (2004).

The reason for lower MCV recorded for the GNC diet could be due to the lower crude protein digestibility of the GNC containing diet, which could have resulted in lower availability of amino acids for the synthesis of blood proteins. In addition, groundnut cake is reported to be defficient in some essential amino acids particularly methionine, lysine and tryptophan but which are available in soya beans (Olomu, 1995) and lablab seeds (Lambourne and Wood, 1985). The values were however within the range of 90 to 140fl reported by Mirtuka and Rawnsley (1997) but lower than the findings of Simarak *et al*. (2004). MCH values were within the normal range (Mirtuka and Rawnsley, 1997; Jain, 1993). MCHC values of the experimental birds were however generally lower than the range of 33 to 47% reported by the same authors, but similar to the value of 28% reported by Simarak *et al*. (2004).

Lower levels of agranulocytes, except for eosinophyls, in birds fed LSM, might be an indication that the antinutritional factors contained in the lablab were reduced to levels that were not toxic to the birds. The treatment method used for lablab in this experiment therefore seems to be efficient in detoxifying the feed ingredient.

There is direct relationship between quality of feed ingested and the blood composition of broilers. Significantly higher values of red blood cells, Hb and PCV were recorded in broilers fed high protein diets than those fed low protein diets (Mirtuka and Rawnsley, 1997). Macrocytic condition of erythrocytes for mean cell haemoglobin (MCH) (pg), mean cell haemoglobin concentration (MCHC) (g/dl) and mean corpuscular volume (MCV) (fl) were reported to be within the ranges of 33 to 47, 26 to 35 and 90 to 140, respectively. Simarak *et al*. (2004) reported the following values for Thailand domestic fowls: 2.19 x10^6ul RBC, 2.05 x 10^4ul WBC, 8.5g/dl Hb, 39.11pg MCH, 27.79g/dl MCHC and 141.39fl MCV, respectively.

Results in these haematological parameters therefore indicated that the birds were in good health, irrespective of dietary treatments. According to Akpodiete and Ologhobo (1998), nutrients are first available in the blood upon digestion before being utilized by body tissues; therefore, haematological parameters are good indices for assessment of health status of birds. LSM has therefore proved to be sufficient in providing for the physiological needs of the birds and favourably compares with GNC and FFS.

CONCLUSION

It can be concluded that the experimental diets used in this study contained adequate levels of nutrients to support growth of broilers at the finisher phase. Haematological parameters were not significantly affected by the treatments. LSM can therefore replace either GNC or FFS as t he major source of protein in broiler diets without affecting the health status and performance of the birds.

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