

## Apparent Nutrient Retention and Haematology of Shika Brown Pullet Chicks Fed Three Plant Protein Sources

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### Abstract

*An experiment was carried out to determine apparent nutrient retention and haematological indices of pullet chicks fed three plant protein sources. 243 day old Shika Brown chicks were divided into three treatment groups of 81 chicks subdivided into three replicate groups of 27 chicks. Three experimental diets were formulated to contain groundnut cake (GNC) Full fat soya (FFS) and lablab seed meal (LSM) and fed to the chicks for five weeks (3-8 weeks of age). At the 8<sup>th</sup> week three chicks per replicate were kept in metabolic cage and fed for faecal sample collection. Feed and faecal samples were weighed, oven dried and analyzed for proximate and mineral composition. Blood samples were collected via wing vein from 1 chick per replicate and stored in EDTA bottles for haematological analysis. Results indicated that retention of dry matter, nitrogen free extract and calcium were similar for chicks fed GNC and FFS but significantly different ( $P<0.05$ ) from those fed LSM. Crude fibre retention was higher ( $P<0.05$ ) in chicks fed FFS than those fed GNC and LSM, which were similar. Magnesium and sodium retentions were similar for chicks fed FFS and LSM but significantly different from those fed GNC. Only packed cell volume (PCV) varied significantly between treatment means. Other haematological parameters were similar across treatments and within normal ranges. Nutrients in LSM could be well utilized and safely too as those of GNC and FFS.*

**Keywords:** Shiken brown pullet, vegetable plant protein, blood, digestibility

### Introduction

For layers to convert feed into profitable eggs, there must be adequate caloric intake, sufficient supply of amino acids in suitable proportions and the provision of necessary vitamins and minerals (Oluyemi and Roberts, 2000). Protein is one of the most crucial nutrients in the diets of layers. It is essential for the growth and maintenance of body cells and tissues and for subsequent production. Pullet chicks have been raised on different protein levels from day old to point of lay: 15-22% (Agudu, 1971), 16-20% (Babatunde

and Fetuga, 1976) and 16% (Olomu, 1995). Portsmouth (1978) reported that a crude protein level of 19% is recommended for pullet chicks of 0 to 6 weeks of age in order to enable them have a good start. The ability of a given protein to support a given physiological requirement is primarily a function of the availability and balance of its amino acids in relation to the renewal and synthesis of body proteins (Bolston and Blair, 1982).

Patrick and Phillip (1980) have categorized the sources of proteins for feeding pullets into five groups on their

origin and methods of production viz: vegetable, animal, microbial, synthetic and purified proteins. The essential amino acids that could be provided by any protein source are of great importance. Plant protein sources have been used successfully in feeding pullet chicks although most are low in cystine and methionine with variable and usually low levels of lysine (Church, 1977). Another constraint to the use of plant protein sources is their content of antinutritional factors, which could be toxic and result in digestive losses. However, most are reduced to non toxic levels during oil extraction from the seeds or by heat treatment (Ogundipe *et al.*, 2003).

*Lablab purpureus* is a leguminous crop that is well grown in the tropics (Lambourne and Wood, 1985) and so is grown well by farmers in Sokoto and its environs, usually under irrigation for its herbage, which is used in feeding ruminants. Due to its high seed production, which is not cherished much as food by man, it is readily available at cheaper rate compared to soya beans and ground nut cake. The crude protein ranges from 21 to 34% (Srihara, 1976) which make it a suitable substitute to groundnut cake and soya bean in feeding poultry in this area. This study therefore aims at assessing the apparent nutrient retention and haematology of *Shika Brown* pullet chicks fed diets containing Lablab seed meal compared to those fed groundnut cake and full fat soya as major source of plant protein.

### Materials and Methods

Two hundred and forty three (243) day old *Shika Brown* chicks obtained from

National Animal Production Research Institute (NAPRI) Zaria were used in the experiment. The pullets were divided into three treatment groups of 81 birds. Each treatment group consisted of three replicates of 27 chicks. Three isocaloric, isonitrogenous diets were formulated such that Diets 1, 2 and 3 contained groundnut cake (GNC), full fat soya (FFS) and lablab seed meal (LSM), respectively as the major source of plant protein. The experimental diets were fed to the chicks for five weeks (3-8 weeks of age). The gross and calculated chemical composition of the diets is shown in Table 1. Feed and water were offered *ad libitum*. Medication, vaccination and other management practices were adhered to as recommended by Oluyemi and Roberts (2000).

### Processing of soya beans and lablab seeds

Soya bean and lablab seeds were soaked in cool water for about 20 hours and later boiled for 30 minutes as recommended by Ogundipe *et al.* (2003). The boiled water was decanted and the seeds were spread in shaded open air and allowed to dry for seven days. The dried seeds were separately milled and bagged for use in ration formulation.

### Nutrient retention trial

At 8 weeks of age, three chicks from each treatment were kept in metabolic cage for five days during which the experimental diets were fed. Measured quantity of the diets was offered in the last three days during which faeces were collected. Faeces and feed samples were weighed, oven dried and analyzed for

proximate and mineral composition following the procedures of AOAC (2000). EDTA titration method was used to determine the content of calcium, while phosphorus content was determined by bray number 1 method. Sodium and potassium were determined by flame photometric method.

**Table1:** Gross and chemical composition of the experimental diet fed at chick stage (3-8 weeks of age)

Ingredients (%)	Diet 1 (GNC)	Diet 2 (FFS)	Diet 3 (LSM)
Maize	40.40	36.00	37.15
GNC	17.00	0	0
FFS	0	16.00	0
LSM	0	0	32.00
Maize bran	13.20	15.00	8.00
Rice bran	19.00	19.45	11.00
Fish meal	2.80	4.50	3.80
Blood meal	2.50	2.50	3.50
Limestone	1.55	2.50	1.00
Bone meal	3.00	3.50	3.00
Vit./Min. premix*	0.25	0.25	0.25
Salt	0.30	0.30	0.30
Total	100	100	100
Calculated chemical composition			
ME (kcal/kg)	2861	2862	2861
Crude protein (%)	19.20	19.20	19.20
Crude fibre (%)	5.70	5.90	4.60
Calcium (%)	1.90	2.50	1.70
Phosphorus (%)	0.60	0.80	0.70
Methionine (%)	0.40	0.50	0.40
Lysine (%)	0.80	0.90	0.80

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

### Haematological analysis

At the eight week, three chicks from each treatment were selected for collection of blood samples using needle and syringe. Blood was collected from the wing vein into EDTA treated bottles. The bottles were taken to the Veterinary Teaching Hospital for analysis. Parameters analyzed included packed cell volume

(PCV), white blood cell (WBC), red blood cells (RBC) and haemoglobin concentration (Hb). Other parameters such as mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH and mean corpuscular haemoglobin concentration (MCHC) were calculated using the methods of Jain (1993).

### Statistical analysis

Data generated were subjected to analysis of variance in a completely randomized design using the general linear model programme of the SPSS computer package. Means were compared using Least Significant Difference (LSD) of the same package. (SPSS,1999).

### Results and Discussion

#### Apparent nutrient retention of pullet chicks

The proportion of various nutrients retained by pullet chicks fed diets containing GNC, FFS or LSM is shown in table 2.

**Table 2:** Apparent nutrient retention of pullet chicks fed the experimental diets

Parameter	Diet 1 (GNC)	Diet 2 (FFS)	Diet 3 (LSM)	SEM
Dry matter	62.08 <sup>a</sup>	64.14 <sup>a</sup>	61.07 <sup>b</sup>	0.84
Crude protein	70.33	72.00	69.67	1.09
Crude fibre	44.67	48.33	43.00	1.23
Ether extract	89.33	92.00	86.00	1.77
Nitrogen free extract	61.33 <sup>b</sup>	62.67 <sup>b</sup>	67.33 <sup>a</sup>	0.67
Ash	68.00	69.00	71.67	1.22
Calcium	69.00 <sup>b</sup>	72.00 <sup>a</sup>	68.33 <sup>b</sup>	0.90
Phosphorus	77.33	77.00	77.67	1.44
Magnesium	83.00 <sup>b</sup>	87.33 <sup>ab</sup>	89.67 <sup>a</sup>	1.72
Sodium	95.00 <sup>a</sup>	91.67 <sup>b</sup>	90.00 <sup>b</sup>	0.77
Potassium	90.33	91.67	92.33	0.75

a, b, c: Means along the same row with different superscripts are significantly different ( $P < 0.05$ )

Dry matter and crude fibre retentions were higher ( $P < 0.05$ ) for the GNC (62.08 and 44.67%) and FFS (64.14 and 48.33%) diets compared to the LSM diet (61.07 and 43.00%), while nitrogen free extract was highest for the LSM diet (67.33%). Crude protein, ether extract and ash digestibilities did not differ significantly. Calcium retention was higher for the FFS diet (72%) when compared to the GNC (69%) and the LSM diet (68.33%) ( $P < 0.05$ ). Magnesium retention, which was significantly better for the LSM diet than those fed GNC diet (83%). Sodium

retention was better for the GNC diet (95%) when compared to the FFS (91.67%) and LSM (90%) diets ( $P < 0.05$ ).

These results show that pullet chicks can adequately digest the crude protein component of LSM as they do with GNC and FFS. Although LSM had the lowest crude fibre level compared with GNC and FFS diets, its retention was the lowest. The lower nitrogen free extract observed for the GNC and FFS diets might be due to the effect of the high fibre contents of the diets compared to the LSM diet. Fibre is known to be a diluent of

energy (Longe, 1988) and interferes with the digestion and utilization of other nutrients (Longe, 1988; Iyayi and Bashar, 1998; 1999).

### Haematological indices

Results of haematological analysis of pullet chicks fed diets containing GNC, FFS or LSM is shown in Table 3.

**Table 3:** Haematological indices of pullet chicks fed the experimental diets

Parameter	Diet 1 (GNC)	Diet 2 (FFS)	Diet 3 (LSM)	SEM
PCV (%)	21.33 <sup>b</sup>	21.00 <sup>b</sup>	25.33 <sup>a</sup>	0.54
RBC (X10 <sup>4</sup> µl)	2.36	2.19	2.47	0.17
WBC (X10 <sup>6</sup> µl)	21.83	22.00	24.80	1.18
Hb (g/100ml)	6.73	5.67	7.20	0.59
MCV (fl)	92.21	95.95	102.68	5.65
MCH (%)	28.91	25.65	29.12	2.18
MCHC (%)	31.54	26.83	28.38	2.16
Lymphocytes (%)	51.33	53.67	53.33	2.49
Neutrophils (%)	37.67	37.00	38.67	2.25
Monocytes (%)	6.33	6.33	5.00	1.23
Eosinophiles (%)	4.67	3.00	3.00	0.84

a, b, c: Means along the same row with different superscripts are significantly different (P<0.05)

Packed cell volume was the only parameter that differed significantly (P<0.05) between the treatments, with higher value for the LSM diet (25%) compared to the GNC and FFS diets (21%). PCV values for all treatments were close to normal values (20-27%) reported by Jain (1993), which indicates that birds in all treatment groups were physiologically healthy even though they were significantly different from one another. Various researchers have the significance of PCV to the health status of an animal. Eggum (1976) reported that abnormal variation in PCV impairs the primary physiological functions of the body. Adequate PCV level gives a good understanding of the nutritional status of the bird and provides useful information on the metabolic profile, which is used to

assess the bird's state of health (Suchy, 2000). It has been shown that rats fed restricted diets had lower PCV values than those fed the same diet *ad-libitum* (Simarak *et al.*, 2004). Eggum (1976) also reported that Hb concentration, PCV and MCHC are very sensitive to the level of protein intake by poultry. The three plant proteins used in this study could support good growth and health for subsequent performance of the pullet chicks. This is further evidenced by the fact that agranulocyte levels did not differ between treatments and were all within normal range of healthy birds (Dancie and Lewis, 1991; Simarak *et al.*, 2004).

### Conclusion

From the results of the nutrient retention trial, it could be concluded that

the use of any of three plant protein sources did not negatively affect retention of nutrients by the pullet chicks. The haematological indices also show that utilization of the three plant protein sources support the metabolic and health status of the birds. *Lablab purpureus* seed meal could therefore be recommended for use as a plant protein source in pullet chick diets.

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