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Effect of Differently Processed African Locust Seed Bean on the Haematological and Serum Biochemical Indices of Broiler Chickens in the Semi-Arid Region of Nigeria

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Abstract: *An experiment was conducted to evaluate the nutritional value of different processing methods of African locust bean seed meal (ALBSM) on two hundred and twenty five (225) day old chicks. ALBSM was used at 5%. The birds were randomly allotted to the five diets in groups of forty five (45) each and replicated thrice of fifteen (15) birds. Conventional management practices were strictly adhered to. A set of 2 ml blood samples were taken from 3 broilers per treatment into plastic tubes containing the anti-coagulant ethylene diamine tetra acetic acid (EDTA) and the other bottle without the anticoagulant for the determination of haematological and serum biochemical parameters respectively. The haematology includes PCV, Hb, RBC, WBC, MCV, MCH and MCHC while the serum biochemistry includes total protein, albumin, globulin glucose, cholesterol, urea, creatinine, ALAT and ALAT. Data on haematological and serum biochemical indices were analysed using completely randomized design and significant means were separated using least significant difference. The results for the haematology revealed significant ($P<0.05$) differences among the dietary treatment groups for PCV, Hb concentration, RBC count, and WBC count. The parameters evaluated are all within the recommended haematological range values for broiler chickens. The result obtained in this study revealed that there were significant ($P<0.05$) differences for the serum biochemical indices (albumin, globulin, glucose, cholesterol, creatinine, urea, ASAT and ALAT) among the treatment groups. However, there were no significant ($P>0.05$) differences for total protein among the treatment groups. The values however, did not follow any definite trend. It is concluded that soaking for one day and fermenting for 3days of ALBSM gave the best results among all the four processing methods tested. The processing methods employed did not impede oxygen carrying capacity of the blood in meeting the demand for broilers chickens.*

Keywords: *Broilers; Locust bean; protein; Haematology; Serum.*

INTRODUCTION

The insufficient quantity and quality of protein in the diets of the Nigerian population affects not only the health status and efficiency of the present generation but also the future generation because such deficiency result in various clinical and sub- clinical conditions. These include reduced growth, possible deficiency in mental development of the citizens, impaired health, reduced resistance to diseases and lowered working efficiency in adults. Due to an urgent need to meet the demand and supply of protein of animal origin, it is pertinent to embark on the

production of animal species with quick turn-over rates. The broiler chicken production is the most favourable alternative to bridge the gap of protein supply and demand in Nigeria. The main constraint of the industry is feed because the conventional vegetable protein ingredients such as soyabean and groundnut cake have become scarce and expensive (Longe, 2006). A viable option appears to be the exploitation of legumes which have very low human food preference. The high cost of animal proteins has stimulated interest towards several leguminous seeds as potential sources of vegetable proteins for human food and livestock feeds. Grain legumes are potential substitutes for soybean and groundnut cakes because of the similarity of their amino acid profiles (Saulawa, 2011). The grains of legumes used in poultry diets are considered as the main source of dietary protein. They are consumed worldwide, especially in the developing countries where consumption of animal protein may be limited as a result of economic predicaments.

MATERIALS AND METHODS

The study was carried out at the Poultry unit of the Animal Production Technology, Ramat Polytechnic, Maiduguri, Borno State. The feeding trial lasted for 45 days. Two hundred and twenty five broilers chickens of the 'Abore Acre' strain were purchased from a reputable hatchery. The birds were brooded together for two weeks in a deep litter pen measuring 2m x 3m2. Kerosene stoves and lanterns were used to provide the necessary heat used to maintain the optimum temperature range for the birds at this stage. Feeding was carried out twice daily between the hours of 07.00-08.00 am and 5.30-6.30 pm. Water was provided *ad libitum*. All the necessary vaccines and medication needed by the birds were strictly administered. At the end of the two weeks of brooding, Forty five birds were randomly selected from the pool on the basis of vigour. The birds were randomly assigned to five treatments with forty five birds per treatment in a Completely Randomized Design. Each treatment was further replicated thrice with fifteen birds each. Fresh neem leaves were harvested from neem trees within Polytechnic campus, Maiduguri. The African locust bean seed meal (ALBSM) were differently processed viz; soaked, boiled toasted and fermented and were later ground to fine particle size using a plate mill. The milled ALBSM were incorporated into the diets at level of 50% in treatments 1, 2, 3, 4 and 5, respectively. Treatment 1 had no ALBSM and served as the control. A 23% CP diet (Table 1).

Table 1: Ingredient Composition of the Experimental Broiler Finisher Diet

	Levels of ALBSM (5%)				
Ingredients	**T1**	**T2**	**T3**	**T4**	**T5**
Maize	62.00	60.00	60.00	57.00	51.00
Groundnut Cake	18.00	17.00	16.00	19.00	16.00
Soya bean meal	10.00	10.00	10.00	10.00	10.00
ALBSM	0.00	5.00	5.00	5.00	5.00
Fish Meal	3.00	3.00	3.00	3.00	3.00
Bone Meal	3.00	3.00	3.00	3.00	3.00
Salt (NaCl)	0.30	0.30	0.30	0.30	0.30
Premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25

0.25	0.25	0.25	0.25	Lysine	0.20
0.20	0.20	0.20	0.20	**Total**	**100.00**
100.00	**100.00**	**100.00**	**100.00**	**Calculated analysis**	
ME (Kcal/kg		2967.85	2974.29	8314.13	2945.67
2983.47 Crude protein (%)			19.68	19.67	19.39	18.98
19.69					

T1 (Control), T2 (Soaked), T3 (Boiled), T4 (Toasted) and T5 (Fermented).

was fed to the birds during the finisher phase (29-49 day). All the data collected were subjected to analysis of variance (ANOVA) according to the procedure of Steel and Torrie (1980). Significantly different means were separated according to Least Significant Difference.

RESULTS AND DISCUSSION

Haematological and Serum biochemical Indices of Broiler Chickens

The results for haematological indices (Table 2) revealed significant ($P<0.005$) differences among the dietary treatment groups for Packed Cell Volume (PCV), Haemoglobin (Hb) concentration, Red Blood Cells (RBC) count, and White Blood Cells (WBC) count, respectively. PCV fell within the normal range (22-35%) as reported by Banergee (2007). RBC and WBC values were higher for 5% roasted ALBSM dietary level. This may be attributed to reduction of anti-nutritional factors that might affect the blood compositions of other birds fed other treatments. The values are within the normal range of chickens as reported by Sunchint *et al*. (2004). This observation is also supported by many reports in literature, which generally recommended that cooking for 35 - 40 minutes is adequate for processing legume seeds for monogastric rations, (Balogun *et al*., 2001, Bawa *et al*., 2003; Amaefule and Onwudike, 2000). RBC counts recorded in this study are 2.00 to 3.43 $X10^6/mm^3$ for treatments 1, 2, 3, 4 and 5, respectfully were within the normal range ($2 – 4\ X10^6/mm^3$) for broiler chickens reported by Anon (1998). The results for haematological concentration obtained in this study showed that the different processing methods did not impede oxygen carrying capacity of the blood in meeting the demand for broilers chickens (Egbewande *et al*., 2011). The results obtained for WBC in this study ranged from 10.30 to 11.20 $X10^3mm^3$ for treatments 1, 2, 3, 4 and 5, respectfully were within the normal range for broiler chickens ($9 – 13\ X10^3mm^3$) reported by Aiello and Mays (1998). The effect of cooked ALBSM diets on haematological indices is presented in Table 2. The results obtained for MCV and MCH differed ($P<0.05$) significantly except MCHC showed no significant ($P>0.05$) difference among the treatment groups. The results of haematology did not show any depressive effect of feeding ALBSM. This implied that, all the treatment groups may have adequate immune status.

The results for serum biochemical indices (Table 2) revealed that there were significant ($P>0.05$) differences for the serum biochemical indices (albumin, globulin, glucose, cholesterol, creatinine, urea ASAT and ALAT) among the treatment groups. However, total protein did not differ significantly ($P>0.005$) among the dietary treatment groups. The values however, followed a definite trend. The levels of total blood protein and creatinine contents usually depend on the quantity and quality of dietary protein fed (Awosanya *et al*., 1999; Esonu *et al*., 2001). The albumin values obtained in this study are within the normal recommended range (1.30 to 2.80 g/dl) for broiler chickens as reported by Aiello and Mays (1998). The

slightly higher value recorded for treatment 5 (fermented ALBSM) may suggest a higher protein intake by the chickens, in order to meet the demand for physiological body function. The rise in the globulin levels with subsequent significant rise in the total protein levels was observed to have better resistance and immune response to disease infection according to Abdel-Fatal (2008), globulin levels have been used as indicator of immune response and source of antibody production. The mean urea values obtained in this study ranged from 4.30 to 5.33 mmol/l were in line with recommended values of 4.46 – 4.54 mmol/l by Aiello and Mays (1998). This indicates that ALBSM can be included up to 5% in the diets of broiler chickens without any adverse effect on the serum biochemical indices of broiler chickens.

The mean values for Alanine aminotransferase (ALAT) (16.87 to 26.57 U/L) obtained in this study are in line with the report of Obikaonu *et al.* (2011) who obtained 16.87 to 23.00 U/L. The aspartate aminotransferase (ASAT) values (28.67 to 75.47 U/L) are within the range of 18.00 to 53.33 U/L except treatment T2 reported by the same authors.

Table 2: Haematological and Serum Biochemical Indices of Broiler Chickens Fed Differently Processed African Locust Bean Seed Meal (ALBSM)

	Level of Inclusion of ALBSM (5%)					
Constituents	**T1**	**T2**	**T3**	**T4**	**T5**	**SEM**
Packed Cell Volume (%)	25.40^{b}	26.26^{a}	25.13^{b}	20.13^{c}	26.67^{a}	0.35*
Haemoglobin (gldl)	8.50^{ab}	8.63^{ab}	8.37^{b}	6.70^{c}	8.83^{a}	0.15*
Red Blood Cell (x 10^{6}ml)	2.00^{b}	3.10^{a}	3.40^{a}	3.43^{a}	2.60^{b}	0.18*
White Blood Cell (x 10^{3}ml)	11.13^{a}	10.53^{b}	10.63^{b}	11.20^{a}	10.30^{b}	0.15*
MCV (fl)	20.67^{ab}	20.05^{b}	18.76^{c}	15.00^{d}	21.16^{a}	0.45*
MCH (pg)	6.91^{ab}	6.59^{bc}	6.24^{c}	4.99^{d}	7.01^{a}	0.18*
MCHC (%)	33.46	32.87	33.29	33.21	33.14	0.74^{NS}
Total protein (gldl)	46.00	45.33	44.67	46.00	48.65	18.74^{NS}
Globulin (gldl)	14.67^{b}	13.33^{b}	16.34^{c}	15.67^{a}	15.17^{a}	0.46*
Glucose (gldl)	5.00^{b}	4.23^{d}	4.67^{c}	6.17^{a}	5.33^{b}	0.17*
Cholesterol (mg/dl)	4.20^{a}	4.60^{a}	3.16^{b}	3.50^{b}	4.33^{a}	0.24*
Creatinine (mg/dl)	50.00^{c}	55.67^{b}	61.00^{a}	62.00^{a}	55.00^{b}	69.00*
Urea (mmol/l)	4.43^{b}	4.53^{b}	5.27^{a}	5.33^{a}	4.30^{b}	0.13*

ASAT (IU/L) 0.14*	50.93^{c}	75.47^{a}	28.67^{e}	37.67^{d}	54.33^{b}
ALAT (IU/L) 0.38*	22.23^{c}	18.87^{d}	16.87^{e}	23.47^{b}	26.57^{a}

*a,b,c, = Means within the same row bearing different superscripts differ significantly (P < 0.05), NS = Not Significant (P>0.05), * =Significant (P<0.05), SEM = Standard error of mean, MCV = Mean corpuscular volume, MCH = Mean corpuscular haemoglobin, MCH = Mean corpuscular haemoglobin concentration, ASAT=Aspartate aminotransferase, ALAT=Alanine aminotransferase, T1 (Control), T2 (Soaked), T3 (Boiled), T4 (Toasted) and T5 (Fermented).*

Conclusion and Recommendation

It was concluded that soaking for one day and fermenting for 3days of ALBSM gave the best results among all the three processing methods tested. Based on the findings, it can be concluded that the processing methods tested did not impede oxygen carrying capacity of the blood in meeting the demand for broilers chickens. Investigations into higher levels in the finisher diet were recommended.

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