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Hematopoietic Reaction of Broiler Birds Fed Graded Levels of Boiled *Baobab* (*Adansonia digitata*) Seed Meal as a Replacement for Soyabean in the Humid Tropics

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Abstracts: A study was carried out at the research farm of faculty of agriculture, Abia State University Uturu, in order to determine the hematopoietic reaction of broiler birds fed graded levels of boiled baobab seed meal as a replacement for soya beans meal. Three hundred (300) day old chicks of Anak breed were randomly allocated to five (5) treatments groups of A, B, C, D and E with 60 birds per treatment group replicated thrice of twenty (20) birds per replicate in a Complete Randomized Design (CRD). Treatment group A served as a control group fed diet free (0%) of the boiled baobab seed meal while treated groups B, C, D and E diets were replaced at 25, 50, 75 and 100% levels of baobab seed meal in place of soya beans meal. Treated diets and water were supplied ad-libitum and all management practices strictly adhered to. Blood samples were randomly collected from three (3) birds per replicate at the termination of the study at 8th weeks, after which the blood was sent immediately to the University Laboratory for analysis. Results of the findings revealed insignificant differences ($p>0.05$) in the mean values of PCV amongst all the treated groups (Table 2). On the other hand significant differences ($p<0.05$) due to treatment effects (Table 2) were observed in the mean values of Hb, RBC, WBC, MCV, MCHC, MCH, LYMPH, BASO and NEUTRO amongst the treated groups with treatments group A and B having greater mean values which were statistically different from treated groups C, D and E. However, the results of these findings were within the normal range reported by some authors signifying that the treated birds were healthy and the boiled test ingredient can be used to replace soya bean meal to the maximum level of 100% without any adverse effects in the hematological indices of the birds.

Key words: Broilers, boiled baobab seeds meal, hematology

INTRODUCTION

Majority of African countries including Nigeria are faced with acute food shortages particularly that of animal proteins, solutions to the food problem must be sought through a combination of all available resources. In the light of the above, animal scientists are beginning to screen wild and under-utilized native plants for possible potential use as animal feed ingredients in an attempt to reduce the cost of animal production (Vietmeyer and Janick, 1996; Oeike *et al*., 1997; Yahaya *et al*., 2014).

Several reports have also indicated that hundreds of lesser-known native crop species in sub-Saharan countries such as *baobab* plant are potentially high in nutrients and could possibly relieve critical food shortages particularly that of animal protein, if given adequate awareness and needed research attention (Madubuike *et al*., 1994; Murray *et al*., 2001; Yahaya and George, 2013). Researching on the prospects of utilizing such lesser known and neglected plants, current findings have revealed that quite a large number have useful qualities-either for direct use from the leaves, steams, bark, root or seed protein extraction (Ezeagu *et al*., 2000, 2003, Wekhe, 2002, Yahaya and George, 2013 and Yahaya *et al*., 2014. However, prior to utilization of such unconventional feed resources, data indicating the nutrient composition and toxic substances should be available, furthermore, toxicological evaluation of possible epidemiological response to the ingestion of such novel feed resources and so also the methods of processing which will enhance their utility as food for man and its usage as animals feed ingredients are all necessary in order to achieve optimal utilization (Longvah *et al*., 2000 and Yahaya *et al*., 2012).

Baobab is a well-adapted deciduous tree native to the arid parts of Central Africa and widely spread in the Savannah Regions of Nigeria (Wickens, 1980). Its leaves or bark and fruit are used as food and for ethno-medicinal purposes for man in many parts of African Countries. In the Sahel, for example, *baobab* leaf is a staple soup in the Northern Nigeria, the leaves are used to make "*miyan kuka*"., a soup prepared by boiling the leaf in spices water and it was reported to be a rich source of Vitamin C (Ezeagu *et al*., 2003). During an acute seasonal food supply, fluctuation or famine

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periods, the leaves and fruits of baobab are particularly used as supplementary and emergency food (Humphrey *et al*., 1993).

The seed has a relatively thick shell, which is not readily separated from the kernel, the kernel is edible but the difficulties of decorticating seem to have limited its use as food for man or as animals feed ingredients, consequently large quantities are left unused as wastage. However, the increasing pressure of world population with Nigerian population stands at about 160 million couple with the predictable food shortages necessitated a demand to exploit new resources for animal feed ingredients in order to drastically reduce competitions with food consumed by man, poultry and industries. Few reports have indicated the composition of the baobab fruit pulp and leaves in animal nutrition (Nour *et al*., 1980, Yazzie, 1994, Abdu, 2012, Saulawa *et al*., 2014).

Reports on the nutritional and biochemical evaluation of the whole seed are scarcely available, an earlier report had indicated the potential of its use as food component or feed supplement (Saulawa *et al*., 2014, Saulawa *et al*., 2012). This study therefore, seeks to verify further the nutritional qualities of baobab seed as a protein source and the effect of processing method on the nutritional quality of broiler birds.

MATERIALS AND METHODS

Environment of the study: The study was carried out at the livestock unit of Abia State University, Uturu in Abia State of Nigeria. The raw seeds of *baobab* were sourced from Dutsin-Ma local government area in Katsina State of Nigeria. The processing of the raw *baobab* seed was carried out in accordance to the procedure of Ukachukwu (2000), the *baobab* seeds were boils for one hour and sorted out to remove dirty material thereafter it was poured into boiled water where its boils for 20 min. Later, the water was replaced with fresh boiled water and allowed to boil again for another 20 min. Finally, the seeds were later open dried under shade.

Experimental birds: A total of three hundred (300) day old chicks breed of (Anak birds) were used in this study in a Complete Randomized Design (CRD), randomly assigned into five treatment groups of A, B, C, D and E with sixty (60) birds per treatment group replicated thrice of twenty (20) birds per replicate. The boiled *baobab* seed meal (BBSM) was used to replace soya beans at inclusion levels of 25, 50, 75 and 100% for treatment groups B, C, D and E, while treated group A served as a control group fed diet free of the test diet. The test diets and potable water were supplied at *ad libitum* throughout the period of eight (8) weeks that lasted for the study, so also all vaccinations and other conventional management practices were strictly adhered to.

Collection of blood samples: Blood samples were collected at the end of 8th weeks which was the termination period of the experiment and three (3) birds were randomly picked from each replicate where about 5ml of blood from each bird was collected using needle and syringe via chest into a labeled sterilized bottle containing ethylenediamine tetra-acetic acid (EDTA). At the end of the blood collections, the collected blood samples were immediately sent to the University laboratory for screening of hematological parameters.

Determination of Blood Constituents: Packed Cell Volume (PCV) was determined by microhaematocrit method (Sweason, 1997). Haemoglobin (Hb) concentration was measured spectrophtometrically by cyanomehaemoglobin method (Sweason, 1997) using SP6-50 UV Spectrometer (pye unicam England). The red blood cell (RBC) and white blood cell counts were estimated using haemocytometer (Sweason, 1997). Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin Concentration (MCHC) and Mean Corpuscular Hemoglobin (MCH) were calculated from the values of Hb, PCV and RBC.

MCV, MCH and MCHC were calculated as follows:

$$\text{Mean vorpuscular volume (MCV)} = \frac{\text{PVC X 10}}{\text{RBC}}$$

$$\text{Mean corpuscular hemoglobin (MCH)} = \frac{\text{Hb X 10}}{\text{RBC}}$$

$$\text{Mean corpuscular hemoglobin conc. (MCHC)} = \frac{\text{Hb X 100}}{\text{PVC}}$$

Conc: Concentration

Statistical analysis: Data Collected were subjected to analysis of variance (ANOVA) of Steel and Torrie (1980) and were means difference exists, they were separated using multiple range test by using Ducan (1995).

RESULTS AND DISCUSSION

Hematopoietic indices of animals may give insight as to their production performance, their values are widely used to determine systemic relationship and physiological adaptations including the assessment of the general health condition of the animals. Various reports (Aba-Adulugba and Joshua, 1990, Nottiidge *et al*., 1999, Tambuwal *et al*., 2002 and Yahaya *et al*., 2014) have documented hematological indices of domestic animal species in Nigeria. Furthermore, disease diagnosis is based on a recognized pattern to changes in one or more blood hematological analyses.

Hematological results of this study shows no significant differences ($p>0.05$) in the mean values of Pack Cells Volume (PCV) among all the treated groups (Table 2). Although the test diets (*baobab seed*) did not influence the mean values of PCV, however the observed PCV

Table 1: Composition of experimental diets containing graded level of boiled seed meal

	Level of inclusion				
Ingredients	0%	25%	50%	75%	100%
Maize	54.00	54.00	54.00	54.00	54.00
Soybean	22.30	16.73	11.15	5.57	0.00
BBSM	00.00	5.57	11.15	16.73	22.30
Palm kernel cake	14.00	14.00	14.00	14.00	14.00
Fish meal	3.00	3.00	3.00	3.00	3.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Oyster	2.00	2.00	2.00	2.00	2.00
Vitamin premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Methane	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00
Nutrients composition					
Crude protein (0%)	20.72	19.62	18.52	17.42	16.31
M.E(Kcal/Kg)	2910.60	2894.31	2720.65	2708.90	2703.86
Determined composition					
Crude protein (0%)	19.89	18.31	18.09	17.62	17.22
Ether extract	4.01	6.81	6.85	6.85	6.88
Crude Fibre	4.52	5.82	5.86	5.91	5.91
Ash	12.41	12.88	12.46	13.11	12.91
Nitrogen-free extract	56.28	47.18	49.18	48.27	48.66
Dry matter	90.40	92.41	91.76	91.76	91.58
Gross energy (Kcal/g)	3.261	3.199	3.205	1.141	3.102

1 kg of premix contains:

Vitamins A (5,000.00 I.U)	Vitamin D3 (1000000 I.U)	vitamin E (16000 mg)
Vitamin K3 (800 mg)	vitamin B1 (1200 mg)	vitamin B2 (2200 mg)
Niacin (22000 mg)	Niacin (22000 mg)	Calcium pontothenate

Table 2: Hematological values of broiler chicken fed graded levels of broiler *baobab* seed meal diet

	Level of replacement of soybeans					
Parameter	0%	25%	50%	75%	100%	±SEM
PCV (0%)	31.15	29.38	26.81	26.14	26.03	2.35
Hb	8.11^{c}	8.41^{c}	10.22^{b}	10.56^{c}	11.13^{a}	0.75
RBC (10^{6}/nn^{3})	2.68^{b}	2.816^{b}	3.07^{a}	3.06^{a}	3.51^{a}	0.48
WBC (10^{6}/nn^{3})	4.32^{a}	4.83^{a}	3.41^{c}	3.81^{b}	3.86^{b}	0.29
MCV	116.23^{a}	127.19^{a}	89.06^{c}	95.22^{c}	74.15^{b}	21.88
MCHC (pg)	33.90^{a}	34.88^{a}	30.12^{b}	31.86^{b}	28.12^{c}	3.00
MCH (%)	39.40^{b}	47.00^{a}	30.33^{c}	25.33^{d}	30.40^{c}	5.47
LYMPH (%)	68.13^{a}	64.11^{b}	67.81^{a}	65.33^{b}	60.17^{c}	4.51
BASO (%)	1.15^{b}	2.00^{a}	1.22^{c}	1.50^{b}	1.48^{b}	0.28
NEUTRO (%)	59.22^{a}	60.11^{a}	52.11^{b}	53.10^{b}	53.00^{b}	6.67

^{a,b,c,d}Treatment means with different superscript are significantly ($p<0.05$) different from other

±SEM: Standard error of mean (BBSM) Boiled baobab seed meal

mean values obtained in this study falls within the normal range of 25-45 as reported by Banerjee (2005). This indicates that the experimental birds were in a good health status which could probably lead to increase in weight gains. It is interesting to note that only abnormally low PCV value can lead to anemia which may lead to decrease in weight. In a similar work, Akovbovbo *et al.* (2014) recorded insignificant differences on hematological parameters of weaner's pigs fed graded levels of Water Hyacinths. The PCV results of this work also agreed with the findings of Olayemi and Moronfolu (2007) who reported insignificant differences ($p>0.05$) in Packed Cell Volume (PCV) of broilers birds fed roasted sesame seed meal (RSSM) as protein replacement for soya beans to maximum of 30%.

Significant effects were observed in the mean values of Hb and RBC of the treated birds, the values increased with an increased in proportion of the test plant in the diets but fall within the normal range of 7-13 and 2.5-3.5 for Hb and RBC as documented by Jain (1986) for birds. Higher Hb and RBC in the blood of birds demonstrate an increased in the transportation of oxygen and nutrients from the lungs and heart to the various body tissues, thereby promoting good health status with an increase in weight gains of the birds. The results of this work gave credence to the findings of Saulawa *et al.* (2013) who recorded significant differences ($p<0.05$) in growth performance indices of broilers birds fed Raw *baobab* seed meal as replacement for soya beans up to 10%. Also in agreement with the results of this work,

Yahaya *et al*. (2012) reported increased in Hb and RBC of rabbits fed white mangrove plants resulting to increased in growth rate of the rabbits.

The results of WBC (10^6/mm^3) also shows significant difference ($p<0.05$) (Table 2) with treatment groups A and B having mean values greater than treated group D and E, while, treated group C had lowest mean values. The obtained mean values of WBC in this study fall within the normal range of 9-31 as reported by Jain (1986). Decrease in the WBC mean values could lead to Leukocytosis (Robert, 1999). The results of this study could be interpreted that the test seed did not introduced any exogenous substances that might have adversely influence the white blood cell counts of the treated birds exposed up to highest levels of 100% of the test seeds. It is convincing to state that there is no imminent hazard that may be associated with the use of this test seeds in broilers feeds. The result of this work is supported by the research works of Olabonji *et al*. (2007) and Ojebiyi *et al*. (2007), these authors fed wild sunflower leaf-blood meal to rabbits and the white blood cell counts were within the normal range as reported by Mitruka and Rawnsley, (1977).

Significant differences ($p<0.05$) due to treatment effects (Table 2) were observed in the mean values of LYMPH, BASO and NEUTRO on the birds with treatments group A and B having greater mean values which were statistically different from treated groups C, D and E. This results shows that the broiler birds were able to utilize the test seeds efficiently thereby increasing their blood formations and also enhancing body defense, since lymph nodes and neutrophils are only higher in the blood when there is presence of foreign harmful substances in the blood. Therefore the mean values recorded in the treated groups with higher concentration of the test seeds confirm the safety of the test plant.

Similarly significant effects were observed in the mean values of MCV and MCHC where treated groups A and B had the higher mean values when compared with other groups. Estimating the Mean Corpuscular Volume (MCV) is useful tool for determining the type of anemia an animal might have, while an estimate of MCHC is a further guide to the investigation of the anemia. The significant effects ($p<0.05$) observed in the mean values of MCV and MCHC did not exposed the birds to any form of anemia, since there was an increased in Hb and RBC production in this study. Barger (2003) reported that any increase in MCV, MCH and decrease in MCHC of non ruminants animals above or below the normal range indicates macrocytic or hypochromic anemia. The results of these findings were within the normal range signifying that the treated birds were healthy and the test seeds can be used to replace soya bean meal to the maximum level of 100% without any adverse effect.

Conclusion: Based on the result obtained in this work, it appeared that using Boiled baobab seed meal as a replacement for soya beans up to the maximum of 100% in broiler diets has no adverse effects on the hematopoietic parameters of broilers birds. Feed accounts for 75% costs of production in poultry industry, therefore, the use of baobab seed meal to replace expensive soya beans particularly in broilers production will definitely reduce the cost of producing one kg of broiler meat. Evidently this will increase the profit margin of the farmers and also reduce competition of soya beans consumption with Man. This finding further portrays the fact that Nigerian Government should encourage animal scientist with financial backing and facilities to enable them conduct more research works on un-exploited indigenous wild plants for animals and man usage. Boiling is therefore recommended as a processing method for raw baobab seed in broiler production without negatively affecting the hematopoietic reaction of the birds.

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