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Haematology and Serum Biochemistry of Broilers Fed Diets Supplemented With Palm Bunch Ash

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Abstract
Palm bunch were collected from a local palm processing unit at Umuagwo, Imo State, Nigeria. It was cleaned, sundried and burnt to produce Palm bunch ash (PBA). It was analyzed for mineral concentration using atomic absorption spectrophotometer. One hundred day old Arbor acre broilers were used to assess the hematological indices of broilers fed graded levels PBA in a 7 week feeding trial. The birds were divided into four groups of thirty birds each which were further replicated three times with 10 birds per replicate in a completely randomized design. At each developmental stage, four experimental diets were formulated and offered to the birds such that the control diet had no PBA, whereas the other three diets contained graded levels of PBA at 0.05, 0.10, 0.15 kg/100 kg starter and 0.10, 0.15, 0.2 kg/100 kg of feed for finisher respectively. Proximate and mineral analysis of the feeds was determined. At the 7th week of the experiment, haematological indices were determined. Most hematological indices like red blood cell ($5.467x10^6$), haemoglobin (2.300g/dl) and packed cell volume (37.13) were significantly higher ($p<0.05$) than other treatments were within the normal ranges for chicken. However, T2 had significantly higher ($p<0.05$) values for mean cell volume than other treatment groups though all the values are within the range. Blood coagulation time reduced with average levels of palm bunch ash in the diet.

Keywords: Broilers, blood characteristics, palm bunch ash

Introduction

When fruits of palm bunch had been harvested, the bunch was often undervalued and considered more or less as waste material and creates disposal problems. However, previous studies on some plant wastes including plantain root base and stalk (Okoli *et al.*, 2012), Coconut shell (Iwu *et al.*, 2013), Palm kernel shell (Akpakpan *et al.*, 2012; Ohanaka, 2015) have shown them to be rich in elemental composition. Ohanaka (2015) reported mineral values in the order of mineral elements in PKSA was K> Mg> Ca> P> Na> Fe>Mn> Zn> Cu for palm kernel shell ash, indicating that it contained more K and Mg than Ca and P. The very high value of K in the ash is of interest because K is often called the alkalizer and chiefly neutralizes acids and restores alkaline salts to the blood stream. However most studies (Nwogu, 2013; Ohanaka, 2015) have shown a generally lowering of feed intake as a result of increasing inclusion level of plant ash in the diets.

This study therefore evaluates the effects of the palm bunch ash inclusion on the hematological and serum biochemistry of broilers.

Materials and Method

This research was carried out at the Research Farm of Imo State Polytechnic, Umuagwo, Imo State, Nigeria. Palm bunch wastes were collected from an oil palm mill at Umuagwo, Ohaji Egbema L.G.A of Imo State. They were washed, sundried, burnt and the ash was sieved with water and particles removed. The wet ash was dried. Mineral composition of PBA was done at precision laboratory, Ibadan, Oyo State. Four experimental diets were formulated in both starter and finisher phases as shown in tables 1 and 2 respectively. The control diets had no PBA inclusion whereas the other three diets at each phase had graded levels of PBA included in the diets at 0.05, 0.10 and 0.15 kg for starter and 0.10, 0.15 and 0.20 kg for finisher respectively per 100 kg of feed in replacement for edible salt. Proximate composition of experimental diets was determined as shown in Table 1. One hundred and twenty (120) day old broiler chicks were used for the experiment. They were divided into four treatments of thirty birds and were further replicated three times in a completely randomized design (CRD).

Blood samples were collected at the end of the 8 weeks period from 3 birds per treatment samples. Blood were collected and emptied into sterilized bottles containing Ethylene diaminetetraacetic acid (EDTA) for haematological analysis. Another set was collected in plain tubes without EDTA for serum biochemistry. Hematological parameters such as packed cell volume, red blood cell, white blood cell and hemoglobin were determined. Mean cell volume and Mean cell hemoglobin concentration were computed using appropriate formulae. Serum biochemical parameters such as serum protein (total serum protein, albumin and globulin), urea, creatinine and cholesterol were determined.

All the data were analyzed statistically using one way Analysis of variance of SPSS (2006). Statistical difference between means was separated by Duncan Multiple range test option of the same software.

Table 1: Nutrient composition of the PBA based diet in broiler chicks (starter phase)

Ingredients (Kg)	T1	T2	T3	T4
Maize	42	42	42	42
Wheat offal	4.6	4.6	4.6	4.6
Soya bean meal	35	35	35	35
Brewers Dried grain	7.52	7.52	7.52	7.52
PKC	5	5	5	5
Fish meal	2.5	2.5	2.5	2.5
Bone Meal	2.5	2.5	2.5	2.5
Premix	0.25	0.25	0.25	0.25
Lysine	0.2	0.2	0.2	0.2
Methionine	0.2	0.2	0.2	0.2
Ash	-	0.05	0.10	0.15
Salt	0.25	0.20	0.15	0.10
Total	100	100	100	100

Table 2: Nutrient composition of the PBA based diet in broilers (Finisher phase)

Ingredients (Kg)	T1	T2	T3	T4
Maize	50	50	50	50
Wheat offal	5.68	5.68	5.68	5.68
Soya bean meal	25	25	25	25
Brewers Dried grain	8.17	8.17	8.17	8.17
PKC	5	5	5	5
Fish meal	2.5	2.5	2.5	2.5
Bone Meal	2.5	2.5	2.5	2.5
Premix	0.25	0.25	0.25	0.25
Lysine	0.2	0.2	0.2	0.2
Methionine	0.2	0.2	0.2	0.2
Ash	-	0.10	0.15	0.20
Salt	0.25	0.15	0.10	0.05
Total	100	100	100	100

Results and Discussion

The results of the effects of different inclusion levels of palm bunch ash on the hematological indices were presented in Table 3. Treatment 1 recorded higher ($p<0.05$) haemoglobin (Hb) than other treatment groups, though they were significantly different. The range of results obtained was within the normal reference range for chicken as reported by Aiello and Mays (1998). However, the Hb values (10.700 - 12.300 g/dl) obtained in this study were a little higher than the range values of 8.7-11.3g/dl reported by Nwogu (2013) when plantain ash was fed to laying birds. It was also higher than the reports of Ohanaka (2015) (10.30-11.60 g/dl) when palm kernel shell ash was fed to broilers.

Table 3: Hematological characteristics of broilers fed diets with graded levels of PBA

Parameters	T1	T2	T3	T4	SEM
RBC($x10^6$)	5.467^a	4.633^b	3.200^c	3.000^c	0.14
Hb(g/dl)	12.300^a	11.867^b	11.233^c	10.700^d	0.17
PCV(%)	37.13^a	35.90^b	33.13^c	32.27^c	0.31
MCV(fl)	119.00^b	128.97^a	84.67^c	86.00^c	1.08
MCH(Pg)	23.07^c	25.60^c	26.60^b	30.87^a	0.98
MCHC(x103)	33.433^a	32.967^a	33.173^a	33.320^a	0.15
WBC	4.200^a	4.000^a	3.467^b	3.200^c	0.07
Clotting time(sec)	37.00^a	33.00^b	32.67^b	30.27^c	0.09

The range of results obtained for packed cell volume (PCV) (32.27- 37.17%) across treatment fall within the normal reference range values 30 - 40% as published by Aiello and Mays (1998). Moreover, the lowest PCV value recorded for T4 was within the limits published for Arbor Acre broilers (Talebi *et al.,* 2005; Ohanaka, 2015). Blood clotting time (BCT) was reduced with increasing levels of PBA inclusion in the diets. BCT was highest in the control birds but lowest for T4 birds. This may suggest

that PBA contains minerals in the forms that reduce BCT such as calcium which has been reported to enhance blood clotting ability (Waldroup, 1997; Ohanaka, 2015). Mean cell haemoglobin (MCH) values progressed towards diet T4 and were superior in PBA inclusion diets. The values obtained were within the normal range of 25.4-33.4 pg reported for chicken by Mitruka and Rawnsley (1977). Mean cell haemoglobin concentration (MCHC) values are also within the normal range for chicken (Aiello and Mays, 1998).When the values or levels of MCH and MCHC are lower, it indicates anaemic condition (Aster, 2004; Ohanaka, 2015). The MCV values show that T2 had a superior value among other treatments. Treatment 2 and Treatment 1 (control) values were within the limits of 100- 128 fl reported by Mitruka and Rawnsley (1977) for normal chicken.

Results of the effects of different inclusion levels of palm bunch ash on the serum biochemical indices were presented in Table 4. Total protein values decreased with increasing inclusion of PBA. Total protein values in this study were higher than the ranges of 3.53- 3.72 g/dl reported by Ohanaka (2015) when palm kernel shell ash was included in broiler ration. The values were however within the reported range of 7.25 - 10.15 g/dl by Nwogu (2013) for plantain ash fed hens. Higher values observed in this study may be indicative that there is enzyme hydrolysis of dietary proteins and shows that the blood pool serves as a major source of amino acid needed for synthesis of protein (Njidda *et al*., 2006). This may imply that the protein levels in the diets are sufficient to sustain or support the normal protein levels in the blood.

Table 4:Serum biochemical characteristics of broilers fed diets with graded levels of PBA

Parameters	T1	T2	T3	T4	SEM
Albumin	2.633d	2.477c	2.425b	2.350a	0.09
Cholesterol (mg/dl)	120.33d	111.50c	95.57b	91.20a	0.28
Creatinine(mg/dl)	1.800a	2.550b	3.167c	3.300c	0.05
Globulin(g/dl)	4.130d	4.040c	3.640b	3.497a	0.17
Urea (mg/dl)	33.00c	30.00b	29.67b	27.00a	0.07
Total protein (g/dl)	6.763d	6.517c	6.083b	5.860a	0.29

Blood urea level declined with increasing PBA inclusion. PBA inclusion may have influenced the reduction in the blood urea values since all the diets had similar crude protein values. Serum cholesterol level was consistently lowered by the ash inclusion indicating the good attributes of the ash treatment to the circulatory system. This is in agreement with the report of Nwogu (2013) that ash supplementation significantly lowers serum cholesterol. Serum creatinine values increased with increasing levels of PBA inclusion. The significant increase in serum creatinine of birds on the test diets when compared to the control givesevidence to the fact that the birds were not surviving at the expense of body reserves (Duwa *et al*., 2012).

Conclusion

Palm bunch ash inclusion did not have any adverse effects on the hematological and serum biochemical characteristics. It is probably a natural accumulator of Potassium which is also an electrolyte. This study has shown the potential value of palm bunch ash inclusion in broiler diets.

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