HAEMATOLOGY AND SERUM BIOCHEMICAL INDICES OF BROILERS FED DIETS WITH PALM BUNCH ASH.

Nwogu, C. M., Nwogu, R..K., Ogbuewu, I.P., Etuk, I.F. and Okoli, I. C.
Department of Animal Science and Technology, Federal University of Technology, Owerri, Imo State.
Corresponding author: Nwogu, C.M. E-mail; marychinwenwogu@gmail.com Tel; 08065447697

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 Abor 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 (CRD). 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, 0.15kg/100kg starter and 0.10, 0.15, 0.2kg/100kg of feed for finisher respectively. Proximate and mineral analysis of the feeds was determined. At the 7th week of the experiment, hematological indices were determined. Most hematological indices like RBC, (5.467x10^{6}), Hb (2.300g/dl) and PCV (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 MCV 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

Mineral electrolytes are commonly known to support a host of body physiologic functions and processes including synthesis of tissue proteins, maintenance of intracellular and extra cellular homeostasis, maintenance of ionic potential across cell membranes and organelles, driving of enzymatic reactions, osmotic pressure regulation and acid-base balance among others (Borges *et al*., 2004; Unamba- Oparah *et al*., 2017). They are therefore essential for optimizing animal nutrition, health, physiology and biochemistry. Among these electrolytes, the monovalent ions (K^+, Na^+, Cl^-) are the key ones involved in acid- base balance of the fluids, because they have higher permeability and greater absorption potential in the digestive tract than divalent ions (Unamba- Oparah *et al*., 2017).

There are many agricultural wastes materials generated from agricultural activities that are littered all over the environment. Some of these agricultural wastes constitute disposal challenge to farmers (Isreal and Akpan, 2016). These wastes have however been known to contain mineral elements when ashed (Akunna *et al*., 2013). Several studies have also reported the high alkalinity of ash derived from these agricultural waste materials (Nwogu *et al*., 2012; Isreal and Akpan, 2016) and are traditionally used as edible ash in the preparation of many traditional foods. Therefore, they are potential viable sources of cheap mineral elements that need to be harnessed for several application especially in animal production (Nwogu, 2013; Ohanaka, 2016; Duruanyim, 2017).

Information about the use of plant ash as mineral supplement in poultry diets is limited. However, recently such ash supplementation has been shown to enhance certain mineral elements absorption from diets fed to broilers, pullets and rabbits (Iwu, 2013; Ebere, 2013; Nwogu, 2013; Ohanaka, 2016). Specifically, Okoli *et al*. (2014) reported a reduction in fecal concentrations of K and Mg, Ni, Fe and Mn in pullets fed plantain ash for 10 weeks. Lead and Cadmium concentrations in the feces however increased, indicating a selective poor absorption of these heavy metals due to dietary plantain ash supplementation (Whitehead *et al*., 1996; Okoli *et al*., 2014). Iwu *et al*. (2013) also reported a mild agonist effect of dietary coconut shell ash supplementation on reproductive organ development and sex hormone release in both male and female rabbits. Ohanaka *et al*. (2016) reported better growth efficiency ratio (GER) in broilers at all growth phases of dietary palm kernel shell ash supplementation, indicating enhanced nutrient utilization. This recent study also reported reduced production costs with increasing palm kernel shell supplementation mostly due to reduction in feed intake of birds without drastic reduction in weight gain. 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 0.15kg for starter and 0.10, 0.15 and 0.20kg for finisher respectively per 100kg 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 EDTA (Ethylene diamine tetra acetic acid) 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 (ANOVA) of SPSS (2012). 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 ($P<0.05$) Hb than other treatment groups, though they were significantly different. The range of results obtained were within the normal reference range for chicken as reported by Aiello and Mays, (1998). However, the Hb values (10.700- 12.300g/dl) obtained in this study were a little higher than the range values of8.7-11.3g/dl reported by Nwogu (2013) when plantain ash was fed to layer birds. It was also higher than the reports of Ohanaka (2015) (10.30-11.60g/dl) when palm kernel shell ash was fed to broilers. The range of results obtained for 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 Abor 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). MCH values progressed towards diet T4 and were superior in PBA inclusion diets. The values obtained were

within the normal range of 25.4-33.4Pg for chicken as stipulated by Mitruka and Rawnsley (1977). MCHC values were 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 100-128fl reported by Mitruka and Rawnsley (1977) for normal chicken.

Table 3.Heamatological 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

^{abcd} Means within rows having different superscript are significantly different ($p< 0.05$)

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- 3.72g/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- 10.15g/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.

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.

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
Totalprotein (g/dl)	6.763d	6.517c	6.083b	5.860a	0.29

^{abcd} Means within rows having different superscript are significantly different ($p< 0.05$)

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