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Haematology and Serum Biochemistry of Starter Broilers Fed Diets Containing Red Sandalwood*(Pterocarpus santolinoides)* Leaf Meal

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ABSTRACT

This study was designed to assess haematology and serum biochemistry of starter broilers fed diets containing red sandalwood (*Pterocarpus santolinoides*). A total of 120 starter broiler chicks used for the study were assigned to four treatment diets corresponding to 0, 5, 10 and 15 % and three replicates per treatment with ten birds in each replicate group. The study lasted for 28 days. Five (5) birds per replicate were used for data collection. Results indicated that there were no significant difference ($p>0.05$) in WBC, MCV, CT, urea and albumin. Significant differences ($p<0.05$) were obtained on HB, PCV, MCH, MCHC, creatinine, glucose, cholesterol, total protein and globulin respectively.

Keywords: Haematology, Serum Biochemistry, Starter broilers, *Pterocarpus santolinoides*

INTRODUCTION

The high nutritive value, short cycle and relative cheap cost of production, make poultry products the ideal animal protein source for feeding the world's human population. However, high feed cost remains a major impediment to efficient poultry production. Many traditional ingredients used in poultry diets are forecast to be in short supply mainly as a result of the increase inhuman population and unfavourable climatic conditions (Diarra and Devi, 2015).The growing demand for traditional energy and protein feed ingredients as food by the ever-growing world's human population and other industrial uses has increased research interest in alternative cheaper ingredients for poultry feeding (Iheukwumere *et al.*, 2008).

Pterocarpus species belong to the family *fabaceae* and they occur through-out the tropics, (Eze *et al.,* 2012 and Nwokorie *et al.,* 2015). *Pterocarpus santalinoids*, commonly called red sandal wood in English, "uturukpa" in Igbo. It is classified under the kingdom Plantae, Order (fabales), family (faboideae), Genus (*Pterocarpus*/ and Species (*santalinoides*) (Anowi *et al.,* 2012).The Nigerian species are trees with bright yellow flowers and usually have alternate leaflets (Opara and Esukpa, 2012). The fruit pod has an usual irregular shape, (Akindahunsi and Salawu, 2005). It is a shade tree commonly found along riverine forest in Africa and tropical South America (Osuagwu, 2008). The plant can also help in erosion control because of the type of root system as well as nitrogen fixation (Otitoju, *et al,* 2014).

Phytochemical studies of this plant indicate that it contains substances such as alkaloids, phenols, saponins, glycosides, flavonoides, triterpenoides, sterols and tannins. In addition, heart wood contains isoflavone, glucosides and two anti tumour lignans, namely: savinin and calocedrin.The leaf is consumed as vegetables and its medicinal use among the 'Igbos' include; the cure of stroke, diarrhea, dysentery, fever and pains (Adeniyi *et al.,* 2012).

Various morphological parts of *Pterocarpus santalinoides* are used in traditional medicine, in many African countries, to treat an array of human ailments. The ethno-medical use of leaves of *Pterocarpus santalinoides* in the treatment of diarrhoea and other gastrointestinal disorders has been scientifically proven with its triglyceride and glucose lowering properties (Okpo *et al.,* 2011). This work was aimed at examining the effects of ethanol leaf-extract of *Pterocarpus santalinoide s*on haematological parameters of albino rats.

MATERIALS AND METHODS

The project was conducted at the Teaching and Research Farm of Imo State Polytechnic Poultry unit, Umuagwo – Nigeria. The site is

situated between longitudes 70 01 0611E and 7° 03' 00" and latitudes 5° 28' 00"N and 5° 30' 00"N in the humid tropical West Africa (IMLS, 2009).

Table 1: Chemical composition of PSLM (*Pterocarpus santalinoides*) Leaf Meal

Moisture content	24.77
Dry matter	89.26
Ash	7.83
Crude fibre	9.46
Crude protein	51.87
Ether extracts	4.25
Carbohydrate	13.40
Metabolisable Energy	836.33 Kcal/100g

Table 2: Phytochemical Composition of PSLM (*Pterocarpus santalinoides*) Leaf Meal Mg/100g

Flavonoid	0.05
Tannin	Not Detected
Saponin	6.46
Glycoside	6.13
Alkaloid	1.12
Oxalate	0.88
Phytate	7.27
Cyanate	0.05
Phenolic	31.45

Pterocarpus santalinoides leaf meals used for this study were obtained from the Forestry Research Farms, Imo State Polytechnic Umuagwo, Nigeria. The leaves were spread on mat and concrete floorto be dried at room temperature. On drying, the samples were milled. The *Pterocarpus santalinoides leaf* meals were subjected to proximate analysis (Table 1) at the Science Technology Laboratory, Imo State Polytechnic Umuagwo, Nigeria, using standard methods (AOAC, 2001).All chemicals and reagents were of analytical standard. Fresh leaves of

Pterocarpus santalinoides were obtained from the Forestry Research Farms, Imo State Polytechnic Umuagwo, Nigeria.

Procurement of Experimental Birds and Brooding

One hundred and twenty (120) day old chickens (Anak 2000 broilers) brooded in the brooder house of the Imo State Polytechnic Umuagwo, Owerri, Nigeria were used for the study. The birds were fed nutrient composition for one week to stabilize the birds before the feeding trial. Out of the lot, 120 one week broiler chickens were on basis of good health, apparent viability and good conformation assigned to four dietary treatments.

Formulation of the Experimental Diets

Four experimental diets were formulated containing 0.00%, 5.00%, 10.00% and 15.00% PSLM (*Pterocarpus santalinoides*) Leaf Meal representing treatments 1, 2, 3 and 4 respectively in which 0% PSLM was the control (Table 3). The ingredients were thoroughly mixed to ensure homogeneity before grinding in a hammer mill. Experimental birds were randomly allocated to the four dietary groups containing 0.00%, 5.00%, 10.00% and 15.00% PSLM for treatments 1, 2, 3 and 4 and were replicated thrice in a completely randomized design. One week old birds were reared on deep litter floor each pen measuring 3.5 m x3.5 m. Each pen was equipped with feeding troughs and drinkers. Electric bulbs and kerosene lanterns alternated as sources of light. Treatment diets and water were administered *ad libitum.* Routine management practices such as vaccination, drug administration and scrupulous cleanliness of the pens and equipment were carefully applied.

Table 3: Ingredient Composition of Broiler Starter Diets

Ingredients	Varying Levels of Replacement			
	T_1	T_2	T_3	T_4
Maize	40.00	40.00	40.00	40.00
Fish Meal	3.00	3.00	3.00	3.00
Groundnut Cake	15.00	10.00	5.00	0.00

PSLM	0.00	5.00	10.00	15.00
Palm Kernel Cake	10.0010.00	10.00	10.00	
Rice Bran	10.00	10.00	10.00	10.00
Bone Meal	5.00	5.00	5.00	5.00
Spent Grain	17.00	17.00	17.00	17.00
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Common salt	0.25	0.25	0.25	0.25
*Premix (Broiler)	0.25	0.25	0.25	0.25
TOTAL	100.00	100.00	100.00	100.00
Calculated C.P (%)	20.21	20.40	20.60	20.79
Ether Extract (%)	4.87	5.18	5.49	5.81
Crude Fiber (%)	9.54	9.65	9.75	9.65
M.E (Cal/kg)	3444.07	3444.26	3444.45	3444.65
Av. Phosphorus	0.873	0.843	0.7233	0.7240
Av. Lysine	0.933	1.012	1.033	1.038
Calcium	9.37	10.70	10.94	10.99

*2.5kg Premix/tonne contain; Vitamin A 10,000 I.U; Vitamin D3 2000,000 I.U, Vitamin E 12,000 I.U. Vitamin K 2.5gm, Thiamine 1.5g, Riboflavin 5g, Pyriboflavin (B6) 1.5g, Vitamin B12 10mg, Biotin 2mg.

Data Collection

Blood samples were obtained from two birds per replicate making a total of six birds per treatment at the fifth week by inserting a new sterile needle into the wing vein of the birds and the extracted 2mls of blood was placed inside sterile test tubes containing anticoagulant. The blood samples collected were analyzed for Red Blood Cell (RBC), Packed Cell Volume (PVC), Haemoglobin (HB), Clothing time (CT) and White Blood Cell (WBC) respectively. Serum biochemical parameters (Creatinine, Urea, Albumin, Glucose, Cholesterol, Total Protein and Globulin) were also evaluated.

Data Analysis

All data generated were subjected to one way analysis of variance (Steel and Torrie, 1980), while significant differences in means were determined using Duncan's Multiple Range Test (Gordon and Gordon, 2004).

Table 4: Effect of *Pterocarpus santalinoides leaf* meal on Haematological Values of Starter Broiler Birds

Parameters	T_1	T_2	T_3	T_4	SEM
HB (g/dl)	10.60^{a}	11.00^{a}	10.05^{ab}	8.50^{b}	0.14^{*}
PCV (%)	35.80^{a}	32.00^{b}	30.70^{b}	26.30^{c}	1.07^{*}
RBC ($x10^{6}$)	7.40^{a}	7.10^{a}	5.40^{b}	3.01^{c}	0.14^{*}
WBC ($x10^{3}$)	5.83	5.40	5.10	4.80	0.10^{ns}
MCV (Fl)	32.70	31.30	30.20	29.70	0.50^{ns}
MCH (pg)	31.60^{a}	28.03^{b}	26.60^{b}	22.10^{c}	1.25^{*}
MCHC (g/dl)	31.40^{a}	30.10^{a}	25.20^{b}	23.27^{b}	0.44^{*}
CT (Sec)	10.40	11.22	12.10	12.36	0.78^{ns}

Abc: means in the same horizontal row with different superscripts are significantly ($P>0.05$) different.

Blood constituents change in relation to the physiological conditions of health. These changes are of value in assessing response of animals to various physiological situations (Khan and Zafar, 2005). Changes in haematological parameters are often used to determine various status of the body and to determine stresses due to environmental, nutritional and/or pathological factors (Afolabi *et al.,* 2010).Haematological parameters such as PVC, RBC, haemoglobin, erythrocytes, MCV, MCH, MCHC and white blood cells can be used as indicators of toxicity and have a broad potential application in environmental and occupational monitoring (Barcellos *et al.,* 2003). They are those parameters that are related to the blood and blood forming organs (Waugh *et al.,* 2001).

Table 5: Effect of *Pterocarpus santalinoides leaf* meal on Serum Biochemical Parameters

Parameters	T_1(0%)	T_2(5%)	T_3(10%)	T_4(15%)	SEM
Urea (mg/dl)	3.07	3.40	3.80	4.20	0.40^{ns}
Creatinine (mg/dl)	3.30^a	3.70^a	6.00^b	6.50^b	0.70^*
Cholesterol (mgl/dl)	35.40^a	34.30^a	33.00^a	28.70^b	0.89^*
Total Protein (G/dl)	73.70^a	68.60^b	66.50^b	60.50^c	2.78^*
Glucose (mg/dl)	38.20^a	35.10^a	32.00^b	28.33^b	1.32^*
Albumin (g/dl)	24.96	24.20	23.40	22.83	0.20^{ns}
Globulin (g/dl)	48.70^a	43.40^b	42.10^b	41.30^b	1.12^*

Abc: Means in the same horizontal row with different superscript are significantly (P<0.05) different.

Experimental Design and Analysis

One hundred and twenty (120) birds were assigned to four treatment diets of 30 birds per treatment in a completely randomized design (CRD) and replicated three times with 10birds per replicate. At the end of the trial, 2 birds per treatment were randomly selected to ascertain the haematological parameters such as Hb, PCV, RBC, WBC MCV, MCH, CT and MCHC. Serum biochemical parameters such as urea, total protein cholesterol and globulin were also evaluated. Data generated during the study period were analyzed using the Stat-view Analytical Computer Package (SAS, 2004).

RESULTS AND DISCUSSION

The haematological indices (PVC, HB, RBC, MCH and MCHC) examined were significantly (P<0.05) influenced by dietary level while MCV, WBS and CT were not (P>0.05) influenced by the experimental diet. Haemoglobins were significantly different (P<0.05) among the treatments. This is in line with (Ihekwumere, 2004 and Okagbare *et al.,* 2011) who indicated that blood variables are affected by dietary

influences which include RBC counts, PCV, Plasma, protein and glucose.

However, the PCV, RBC, MCH, MCHC and HB were significantly affected by the diets. The values obtained were higher in treatment diets than in the control birds except in treatments 3 and 4 which showed lower values than the control diet.

The packed cell volume was significantly different ($P<0.05$) among the treatments. The white blood cell was not significantly different ($P>0.05$) among the treatments. The mean cell hemoglobin was significantly different ($P<0.05$) among the treatments.

The mean cell haemoglobin concentration also significantly differed ($P<0.05$) among the treatments. T_3 and T_4, however recorded highest and were not significantly different ($P>0.05$) among themselves. The packed cell volume (PVC) of treatment 2 is higher than the control. This also agreed with the findings of Akinmutimi *et al.,* 2004who reported that inclusion of *Pterocarpus santolinoides* will encourage performance. The RBC of the experimental birds of treatment 2 was higher than the control except in treatments 3 and 4 but these were all within the normal range for birds as reported by Kameswara *et al.,*(2001). The higher values could be attributed to normal oxygen capacity of the birds for tissues respiration and energy generation in the form of ATP (Offor *et al.,* 2015) the observed difference in the study may be as a result of nutritional status and management (Afolabi *et al.,* 2010).

CONCLUSION

Based on the results of this study, it can be inferred that up to 15% of *Pterocarpus santolinoides* leaf meal could be fed without any deleterious effect on broilers at starter level. Further research could be conducted using higher inclusion levels of the *Pterocarpus santolinoides* leaf meal.

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