HAEMATOLOGY AND SERUM BIOCHEMISTRY OF BROILER CHICKENS FED DIETS WITH AVOCADO (*PERSEA AMERICANA*) SEED MEAL

***Adelowo, Olayinka V., Shon, Evelyen M., Kwaghaondo, Barnabas A. and Gambo, Christopher D.**
Federal College of Animal Health and Production Technology, N.V.R.I., Vom, Plateau State
Correspondence Author: olufisayo71@gmail.com, 08030426283

ABSTRACT
The general acceptability of plants with proven records of medicinal values in the tropics in recent times has necessitated the use of dried avocado (Persea americana) seed meal in diets of broiler chickens. The study was conducted to investigate the hematological and biochemical responses of broiler chickens to various inclusion levels of avocado (Persea americana) seed meal (ASM). Two hundred broiler chickens were randomly allotted to five dietary treatments in a completely randomized design with 0, 2, 4, 6 and 8% inclusion levels of ASM. Each treatment consisted of forty birds with four replicates of ten broiler chickens per replicate. The duration of the study was six weeks and the parameters measured were Packed Cell Volume (PCV), Red Blood Cell (RBC), White Blood Cell (WBC), Platelets, Lymphocytes Neutrophils, Haemoglobin (Hb), total protein, albumin and globulin in the serum. The results showed no significant difference (P>0.05) in the heamatological parameters except lymphocytes and mean cell hemoglobin: although at the normal range which implied that the inclusion level of ASM in broiler diets had no negative effect on the birds up to 8% inclusion level that was studied. It also has positive effect on the total protein, albumin and globulin.
Key words: Hematological, biochemical indices, broiler chickens and Avocado pear

INTRODUCTION
Poultry production has been identified as the fastest means of bridging the protein deficiency gap, especially in developing countries. Broiler birds have been widely reported to be good converters of feed to meat with no religious barriers (Haveenstein *et al*., 1994). The sharp increase in the demand for poultry products in recent times, especially in Nigeria, was attributed to the growth of fast-food restaurants whose major menu source in urban centers is chicken (Akinnusotu, *et al*., 2018). The poultry industry in Nigeria is faced with the challenges of non-availability of conventional feed ingredients (Agbede, 2019). Hence, a search for alternative feedstuffs that could reduce the cost of feed production becomes a relevant factor. A suggestion has been made by Akinsanmi *et al*. (2020) on the need for partial or complete replacement of costly feed ingredients with less costly non-conventional ones. However, the introduction of avocado seed meal in poultry diets suggests a future hope for some neglected plant products in the global economy. Aside the useful protein profiles attributed to avocado seed, Dembitsky *et al*. (2011) explicitly described the importance of the avocado plant product as a provider of folic acid and appreciable amounts of calcium, potassium, magnesium, sodium, phosphorus, sulfur and silicon, as well as vitamins E, B1, B2 and D. The determination of blood components by laboratory tests is an important procedure to assist in the diagnosis of various poultry diseases and disorders. It can be used as a diagnostic tool to assess the impact of environmental, nutritional and pathological stresses. Hematological studies are useful in the diagnosis of many diseases as well as investigation of the extent of damage to blood (Togun *et al*., 2007). Hematological components, which consist of red blood cells, white blood cells or leucocytes, mean corpuscular volume, mean corpuscular hemoglobin is valuable in monitoring feed toxicity especially with feed constituents that affect the blood as well as the health status of farm animals (Oyawoye and Ogunkunle, 2004). As a result of the negative effect of the use of antibiotics in broiler production (Javandel *et al*., 2008), there is a need to utilize non-conventional growth enhancers in broiler nutrition that could improve nutrient digestibility, control pathogenic microorganisms, facilitate intestinal microbial balance and enhance absorption of calorigenic nutrients across the gut wall by increasing its absorption capacity (El-Deek *et al*., 2018). Feed ingredients gotten from plant materials that are of little or no value to man will be an advantage if used in broiler production. The significance of this study is to observe the effect of avocado seed meal in diets of broiler chickens on their serum biochemistry and hematological parameters.

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at the Poultry Unit of the Teaching and Research farm, Federal College of Animal Production Technology, National Veterinary Research Institute, Vom Plateau State Nigeria.

Experimental birds and management

Two hundred (200) 1-day old Cobb broiler chicks were brooded for two weeks with proper vaccination such as IBD vaccine were given for the first week and was repeated at third week, lasota (NCD vaccine) were also given at second week and was repeated at fourth week. Prophylactic treatment and good management practices were properly observed. During the two weeks of brooding, feed and water were given *adlibitum* using chick's feeders and chick's drinkers, respectively. Five experimental starter diet were formulated such that the diets contained 0%, 2%, 4%, 6% and 8% Avocado seed meal (ASM) respectively. The broiler starter diets were compounded with varying level of inclusion of avocado seed meal under clean and hygienic condition as shown in Table 1. At the onset of the trial, two hundred healthy birds were randomly selected and assign to five (5) treatments. Each treatment carried forty (40) birds with four (4) replicates of ten (10) birds each under a completely randomized design (CRD). The five (5) treatments were tagged T1, T2, T3, T4 and T5, the duration of the study was 6 weeks. At day 42, blood sample was collected from three birds per replicate and transferred into labeled and sterilized dry bottles containing Ethylene Diamine Tetracetic Acid (EDTA) anticoagulant for hematological analysis and the parameters measured includes Packed Cell Volume (PCV), Red Blood Cell (RBC), White Blood Cell (WBC), Platelets, Lymphocytes Neutrophils, Haemoglobin (Hb) and other blood indices (MCV, MCH). The total protein, albumin and globulin in the serum were analyzed using a complete automated procedure.

Table 1: Composition of Experimental Diets

Ingredients (%)	**Quantity**				
	T1(0%)	T2(2%)	T3(4%)	T4(6%)	T5(8%)
Maize	48.00	48.00	48.00	47.00	47.00
Wheat offal	14.00	14.00	14.00	13.00	12.00
Soybean meal	17.00	16.10	15.00	15.00	15.00
Groundnut cake	16.10	16.00	14.10	14.10	13.10
Avocado seed meal	0.00	2.00	4.00	6.00	8.00
Fish meal	1.00	1.00	1.00	1.00	1.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Limestone	1.00	1.00	1.00	1.00	1.00
Premix (Bro)	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20
Lysine	0.20	0.20	0.20	0.20	0.20
Common salt	0.30	0.30	0.30	0.30	0.30
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated Analysis					
Crude protein (%)	22.41	21.82	21.23	21.28	20.97
Energy (kcal/kg ME)	2830.96	2848.56	2866.16	2883.14	2909.04
Calcium	1.25	1.25	1.25	1.25	1.25
Available phosphorus	0.65	0.65	0.65	0.65	0.65
Lysine	1.19	1.19	1.19	1.23	1.26
Methionine	0.52	0.52	0.52	0.52	0.53
Crude fibre	4.11	4.11	4.11	4.11	4.09

Statistical analysis

The data obtained was analyzed using one way Analysis of Variance (ANOVA), means were separated using Ducan's multiple range test (DMRT) using Statistical Package for Social Sciences (SPSS version 23) software.

RESULTS AND DISCUSSION

The hematological values obtained in this research were within the normal ranges reported and it also agrees with the report of Aeangwanich *et al* (2004). The result indicate that avocado pear seed meal did not have any negative effects on blood formation. The white blood cell values obtained ranged from 6,950 to 5,000 (10^9/L) with no significant difference across all treatments (P>0.05). The lowest values were recorded in Treatment 3 while the highest was in Treatment 5, this finding agrees with that of Aeangwanich *et al*. (2004) whose research in North-eastern Thailand recorded normal hematological parameters in broiler chickens fed various natural supplements. Birds fed Treatment 3 recorded the highest value (31.00%), which was higher than the control diet, this finding agrees with the result obtain by Akinduro *et al.* (2017), his study reveals that certain medicinal herbs have the tendency to improve haematological parameters in animals. This finding explains the immunity potential of birds fed avocado seed meal, even though there was no significant difference (P>0.05) in the values of WBC obtained. The WBC values obtained were within the range (1.2–3.0×104 µ) as reported by Aeangwanich *et al*., (2004). Also, there was no significant difference (P>0.05) in the values of PCV obtained. The PCV values obtained were within the range (22–35%) as reported by Aeangwanich *et al*. (2004). The WBC values recorded for the experimental birds ranged from 1.43 to 1.81×104 µl. Birds fed the Treatment 3 recorded the highest value (1.81×104 µ), which was higher than those on the control diet, this result could help explain the immunity potential of the dried avocado seed, though there was no significant difference (P>0.05) in the values of WBC obtained. The WBC values obtained were within the range (4,000–8,000 10^9/L) as reported by Aeangwanich *et al*. (2004). The values recorded on the lymphocyte level in the animal's blood showed increased level of their immunity. This finding agrees with the reports of Aeangwanich *et al*. (2004), whose research obtained showed lymphocyte values within the range (45–70%), in birds fed Avocado seed meal.

Table 2: Haematological profile of broiler chickens fed diet containing graded level of avocado seed meal

Parameters	T1 (0%)	T2 (2.0%)	T3 (4.0%)	T4 (6%)	T5 (8%)
White Blood Cells (x 10^9/L)	5,800	5,350	5,000	6,750	6,950
Neutrophils (%)	7.00	7.50	9.00	37.75	24.25
Lymphocytes (%)	78.00^{c}	92.50^{a}	91.00^{ab}	57.75^{d}	69.00^{e}
Red blood cells (x 10^{12}/L)	2.175	1.90	2.30	1.525	1.875
Haemoglobin (g/L)	8.175	10.20	8.00	9.25	10.475
Packed Cell Volume (%)	28.75	31.00	26.25	29.00	30.00
Mean corpuscular volume (*fl)*	149.00	164.25	132.25	197.50	163.50
Mean Cell Hemoglobin *(pg*)	41.05^{d}	53.05^{c}	40.40^{d}	79.85^{a}	57.13^{b}
Mean Cell Hemoglobin concentration (g/dL)	28.875	32.70	30.575	40.30	34.95

^{abc} – means within the treatments having different superscript differs significantly.

The serum biochemical indices showed that Total protein, Albumin and Globulin were not adversely affected by feeding broiler with avocado pear seed, rather higher values were recorded compared to the control with highest values of 66.468, 20.298 and 46.170 for Total protein, Albumin and Globulin respectively. The blood proteins are formed in the liver, and plasma protein synthesis is usually reduced in severe liver damage or prolonged protein deficiency, a situation which was not recorded in the results of this study. According to Aro *et al*., 2012, the concentration of biochemical substances in the serum changes in abnormal conditions therefore, aids in disease diagnosis.

Table 3: Serum biochemical profile of broiler chickens fed diet containing graded level of avocado seed meal.

Parameters	T1 (0%)	T2 (2.0%)	T3 (4.0%)	T4 (6%)	T5 (8%)
Total Protein (g/L)	51.760[d]	51.595[d]	53.808[c]	58.578[b]	66.468[a]
Albumin (g/L)	16.503[c]	17.805[bc]	16.020[c]	18.413[b]	20.298[a]
Globulin (g/L)	37.758[c]	33.790[d]	37.788 [c]	40.143[b]	46.170[a]

[abc] – means within the treatments having different superscript differs significantly.

CONCLUSION

It can be concluded from the study that avocado seeds meal in broiler diets has positive effect on the haematological parameters, it also revealed the improved quality and general wellbeing noticed during the trial exercise. Therefore, avocado seed meal can be added to diets of broiler chickens at up to 8% inclusion level.

REFERENCES

Aeangwanich, W., Simarakas, S., & Chinrasri, O. (2004). Haematological erythrocyte and serum biochemical value of the Thai indigenous chicken (*Gallus domesticus*) in North-eastern Thailand. *Songklanakarian Journal of Science Technology*, 26 (3), 425-430.

Agbede, J.O. (2019). Alternative feed resources: Key to profitable livestock enterprise in Nigeria Inaugural lecture series 109. Federal University of Technology, Akure. Nigeria.

Akinduro, V.O., Onibi, G.E. and Osho, I.B. (2017). Analysis of some phytochemicals in selected spices used in Nigeria pepper soup. *Uniosun Journal of Agriculture and Renewable Resourses*, 1, 68-75.

Akinnusotu, A., Akinsanmi, S.K, Aladekoyi, G., & Adeniran, O.A. (2018). Nutrients and antinutrients composition of three different poultry feeds in Ondo state, south western Nigeria. *Journal of Environmental and Agricultural Science*, 14, 46-53.

Akinsanmi, S.K., Igbasan, F.A., Agbede, J.O., & Akinnusotu, A. (2020). Growth performance and Carcass Characteristics of broiler Chickens fed Graded levels of differently processed Rubber Seed Meal based Diets. *International Journal of Environmental, Agriculture and Biotechnology*, 5 (4), 1187-1195.

Aletor, V.A., and Egbenrongbe, O. (2012). Feeding differently processed soybean. Part 2: An assessment of haematological responses in chickens. *Die Nahrung*, 36, 364-369.

Aro, S.O., Agbede, J.O., Dairo, E.O. and Aletor, V.A. (2012). Evaluation of fermented cassava tuber waste in broiler chickens feeding. *Archiva Zootechnica*, 15, 49-60.

Dembitsky, V.M., Poovarodom, Leontowicz, H., & Vearaslip, S. (2011). The multiple nutrition properties of some exotic fruits: Biological activity and active metabolites. *Food Research International,* 44, 1671-1701.

El-Deek, V. N. (2018). Haematological and biochemical indices of broiler chickens fed ginger (*Zingiber officinale*) based diets. *Ife Journal of Agriculture*, 30(2). 1- 7.

Haveenstein, G.B., Ferket, P.R., Scheilder, S.F., & Larson, B.T. (1994). Growth livability & feed conversion of 1957 vs 1991 broiler when fed typical 1957 & 1991 broiler diets. *Poultry science*, 78, 1785-1794.

Javandel, F., Navidshad, B., Seifdavati, G. H., Pourrahimi and Yaghoub, S. (2008). The Favourite Dorsage of Garlic Meal as a Feed Additive in Broiler Chickens Ratios. *Parkistan Journal of Biological Science*, 11(13): 1746-1749.

Oyawoye, U. and Ogunkunle, J. (2004). The Effect of Garlic (*Allium sativum L.*) Meal as a Feed Ingredient in the Diets of Broiler Chickens. Department of Animal Science. Ahmadu Bello University, Zaria, Nigeria.

Togun, V. A., Oseni, B. S. A., Ogundipe, J. A., Arewa, T. R., Hammed, A. A., Ajonijebu, D. C., Mustapha, F. (2007). Effects of chronic lead a d m i n i s t r a t i o n o n t h e haematological parameters of rabbits – a preliminary study (p. 341). Proceedings of the 41st Conferences of the Agricultural Society of Nigeria.