

APRW-32

**Haematological and Serum Biochemical Indices of Finisher Broilers Fed
Spondias mombin Leaf Meal**

V.N. Okonkwo and A.C. Esiegwu

Department of Animal Science and Fisheries, Imo State University, P.M.B. 2000, Owerri –Nigeria.

Corresponding author: A.C. Esiegwu; E-mail: arthuresiegwu@yahoo.com ; Tel: 08032457629

Abstract

An experiment was conducted to investigate the effect of *Spondias mombin* leaf meal on the blood indices of broiler finisher birds. *Spondias mombin* leaf meal was used to formulate four broiler finisher rations at 0.0%, 5.0%, 10.0% and 15.0% inclusion levels. Four groups of fifteen broiler chicks (28 days old) of Agrited breed were randomly assigned to four treatment diets in a completely randomized design and fed for 28 days. Each group was further subdivided into three replicates of five birds each. At the end of the feeding trial, blood was collected from three birds per treatment for haematological and biochemical analysis. Results showed that the haemoglobin and the red blood cells were significantly decreased ($p < 0.05$) at 10.0 and 15.0% dietary levels compared to the control. The packed cell volume and the neutrophils were significantly decreased ($p < 0.05$) at 15.0% dietary level. Cholesterol was significantly decreased at 10.0 and 15.0% dietary levels. It was therefore concluded that, *Spondias mombin* leaf meal was not toxic to the blood of finisher broilers and therefore could be incorporated into broiler finisher ration up to 15.0% level without any damage to the blood.

Keywords: Blood indices, finisher broilers, *Spondias mombin*, leaf meal.

Introduction

The need to increase the production of poultry and livestock products is becoming very urgent due to the low intake of proteins which is at 4.5 grams per caput per day as opposed to 34.4grams per caput per day recommended by World health organization (WHO) (Anon, 1981). The major militating factor in production of poultry products is high cost of feed ingredients as reported by Okorie *et al.* (2016) that quality feeds are expensive because most of the constituent feed materials such as soya bean, maize, fish meal and groundnut cake are utilized not only by the animals but by humans and industries as well. This factor has resulted in high cost of production and consequently high cost of poultry products. This has triggered research into the use of leaf meals as a feed resource. It has been reported that leaves from *Alchornea cordifolia* (Udedibie and Opara, 1998) and *Azadirachta indica* (Esonu *et al.*, 2005) could be of value in poultry diets. Plant leaves from which leaf meals are produced are relatively free and available with little cost on harvesting and processing. The feed value of any plant, if it is of good nutritional effect will drastically reduce the cost of poultry feed when incorporated and make poultry protein available on the table of both the rich and the poor man. *Spondias mombin* is one of those leaf meals with a promising potential to serve as feed resource. *Spondias mombin* (Ijikara in Ibo) is widely used in traditional medicine in Nigeria and Igbo land in particular. Oladunmoye (2007) reported that the methanolic extract of *spondias mombin* affected the haematological parameters of rats resulting from *in vivo* antimicrobial activity on some pathogens. It has been reported that the plant has wide range of antibacterial, antiviral and antifungal properties (Corthout *et al.*, 1999). Ayoka *et al.* (2008) reported that the fruit is used in making wine and jams. It has also a blood lipid lowering activity (Igwe *et al.*, 2008). Haematology is the study of the numbers and morphology of the cellular elements of the blood and the use of these results in the diagnosis and monitoring of disease (Merck, 2012). The effect of a particular feedstuff on the blood profile of an animal will determine whether such a feedstuff is healthy or unhealthy for an animal to consume and reflects the extent to which an animal is exposed to toxicant feedstuffs which invariably affects the overall performance of the animal (Okonkwo and Esiegwu, 2017).

This study therefore, was aimed at investigating the effects of *Spondias mombin* leaf meal on the blood indices of finisher broilers.

Materials and Methods

This experiment was carried out at the poultry unit of teaching and research farm, Imo State University Owerri, which is located within the South-Eastern agro-ecological zone of Nigeria. Owerri lies between latitude 5°29'North and longitude 7°20'East. It is about 91m above sea level with annual rainfall, temperature and humidity ranging from 1,500 mm to 2,200 mm, 20.0 – 27.5°C and 75 – 90%, respectively (Accuweather, 2015).

Spondias mombin dried leaf meal was used to formulate four broiler finisher ration at 0.0%, 5.0%, 10.0% and 15.0% inclusion levels designated as T1, T2, T3 and T4, respectively (Tables 1 and 2). Four groups of fifteen broiler chicks (28 days old) of Agrited breed were randomly assigned to one of the four treatment diets in a completely randomized design and fed for 28 days. Each group was further subdivided into three replicates of five birds each. At the end of the feeding trial, blood was collected from three birds per treatment for haematological and biochemical analysis as outlined by Ochie and Kolhatkar (2000).

Data collected were subjected to analysis of variance using the SPSS software (2012). Where analysis of variance indicated significant treatment effects, means were compared using Duncan's New Multiple Range Test (DNMRT) (SPSS, 2012).

Table 1: Proximate composition of *Spondias mombin* leaf meal

Components	Amount (% DM)
Moisture	10.71
Crude protein	26.20
Ether extracts	8.97
Crude fibre	17.98
Ash	7.89
Nitrogen free extract	28.25
Metabolizable energy (Kcal/kg)	2706.02

Table 2: Ingredients and calculated nutrient composition of the experimental diets

Ingredients	T1 (0%)	T2 (5%)	T3 (10%)	T4 (15%)
Maize	56.00	51.00	46.00	41.00
<i>Spondiasmombin</i> leaf meal	0	5	10	15
Fish meal	2.00	2.00	2.00	2.00
Soyabean meal	13.00	13.00	13.00	13.00
Groundnut cake	8.00	8.00	8.00	8.00
Palm kernel cake	10.00	10.00	10.00	10.00
Wheat offal	6.00	6.00	6.00	6.00
Bone meal	4.00	4.00	4.00	4.00
Salt	0.25	0.25	0.25	0.25
Trace-mineral/vitamin premix*	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
L-lysine	0.25	0.25	0.25	0.25
Calculated nutrient composition (% DM)				
Crude protein (Cp)	19.56	20.43	20.88	21.14
Metabolizable energy (Kcal/kg)	2844.82	2808.52	2772.22	2735.92
Crude fibre (Cf)	4.20	4.97	5.73	6.5
Calcium (Ca)	1.60	1.60	1.60	1.6
Phosphorous (P)	1.14	1.13	1.11	1.1
Lysine	1.19	1.18	1.17	1.16
Methionine	0.6	0.59	0.58	0.58

*Provided the following per kg of feed; vitamin A, 1000 iu; vitamin D3, 1500 iu; vitamin E, 51 mg; vitamin K, 2 mg; Riboflavin, 3 mg; Pantothenic acid, 10 mg; Nicotinic acid, 25mg; Choline, 350 mg; Folic acid, 1mg; Mg, 56 mg; Iodine, 1 mg; Fe, 20 mg; Zn, 50 mg; Co, 1.25 mg.

Results and Discussion

The results of the haematological and serum biochemical indices of finisher broilers fed *Spondias mombin* leaf meal are shown in Tables 3 and 4. The haemoglobin, packed cell volume, red blood cell and neutrophils showed significant differences ($p < 0.05$). The haemoglobin ranged from 10.90 to 11.90 g/dl. 20 and 30% dietary levels of *Spondias mombin* leaf meal were significantly decreased ($p < 0.05$) compared to the control. The values were within the normal reference ranges (7.0 – 13.0 g/dl) (Banerjee, 2013). This possibly suggests that there was adequate proteins and iron for haemoglobin synthesis and oxygen transport to the tissues. Iron is a very important component of haemoglobin. Adequacy of iron will produce a normal concentration of serum

haemoglobin. The values obtained were higher than the 7.40 – 8.27 g/dl reported by Onimisi *et al.* (2016) but similar to 9.65 – 11.65 g/dl reported by Emenalom *et al.* (2009) for finisher broilers fed *Mucuna pruriens* leaf meal. The packed cell volumes indicated that 10.0% and 15.0% dietary levels were significantly decreased ($p < 0.05$) compared to the control. The values obtained from this study were higher than the values 14.0 – 19.0% reported by Ukpabi *et al.* (2015) when raw *Adenanthera pavonina* seed meal was fed to finisher broilers and within the normal range (35.9 – 41.0%) (Merck, 2012; Wikivet, 2013). A decrease in packed cell volume was an indication of liver and kidney disease (Demoranville and Best, 2013). Esonu *et al.* (2001) also reported that reduction in the concentration of packed cell volume suggests the presence of a toxic factor with adverse effect on blood formation. The normal value for the packed cell volume observed in this work indicated absence of toxicity and a healthy state of the animal and good blood formation. Red blood cell ranged from 10.83 to $12.00 \times 10^{12}/L$ decreasing significantly ($p < 0.05$) as the inclusion level of *Spondias mombin* leaf meal increased. The values were higher than the values (2.41 – 3.14) reported by Ashom *et al.* (2016) and within the normal range (7 – 112 μm) reported by Banergee (2013) indicating that the birds were not anaemic.

Biochemical indices showed no treatment effect for total serum protein, albumin, globulin, urea, creatinine and alkaline phosphatase. Cholesterol was decreased significantly ($p < 0.05$) at 10 and 15% dietary levels. The low serum cholesterol observed was suggestive that *Spondias mombin* has anti-cholesterol action. It was also indicative of normal fat metabolism and utilization. Bush (1991) reported that low levels of cholesterol were an indication of fat malabsorption in the body and in the blood.

Table 3: Haematological indices of finisher broilers fed *Spondias mombin* leaf meal

Parameters	T1 (0%)	T2 (5.0%)	T3 (10.0%)	T4 15.0%	SEM
Haemoglobin (g/dl)	11.90 ^a	11.60 ^{ab}	11.30 ^{bc}	10.90 ^c	0.13
Packed cell volume (%)	36.33 ^a	36.00 ^a	34.33 ^{ab}	32.66 ^b	0.56
Red blood cell ($\times 10^{12}/L$)	12.00 ^a	11.60 ^{ab}	11.26 ^b	10.83 ^c	0.14
Mean cell volume (fl)	130.30	131.03	130.30	132.10	0.37
Mean cell haemoglobin (Pg)	19.80	20.00	20.06	20.13	0.07
White blood cell ($\times 10^9/L$)	11.23	11.16	10.93	10.70	0.09
Neutrophils (%)	53.33 ^{ab}	50.66 ^b	53.00 ^{ab}	54.33 ^a	0.53
Eosinophils (%)	1.33	1.66	2.00	1.33	1.48

^{abc}Means within the same row with different superscripts are significantly different ($p < 0.05$)

Table 4: Serum biochemical indices of finisher broilers fed *Spondias mombim* leaf meal.

Parameters	T1 (0%)	T2 (5.0%)	T3 (10.0%)	T4 (15.0%)	SEM
Serum protein (g/dl)	5.77	5.60	5.67	5.67	0.60
Albumin (g/dl)	2.33	2.20	2.13	2.07	0.62
Globulin (g/dl)	3.43	3.40	3.53	3.60	0.83
Urea (Mmol/l)	8.33	8.20	8.36	8.16	0.04
Creatinine (Mmol/l)	21.33	22.66	21.33	20.33	0.39
Cholesterol (Mmol/l)	9.26 ^a	9.23 ^a	8.73 ^b	8.60 ^b	0.09
Alkaline phosphatase (μ/l)	1.36	1.23	1.16	1.23	0.04

^{ab}Means within the same row with different superscripts are significantly different ($p < 0.05$)

Conclusion and Recommendation

The result of the trial showed that *Spondias mombin* leaf meal had no deleterious effect on the haematological and serum biochemical indices of finisher broilers up to 15% dietary level. It was therefore, concluded that 15% dietary level of inclusion is safe for finisher broilers.

References

- Accuweather (2015). Weather for Owerri, Nigeria. <http://www.accuweather.com/en/ng/owerri/253317/weather-forecast/253317>. Retrieved on November 15, 2015.
- Anon (1981). The green revolution: A livestock production plan for Nigeria. Interim report 2(1): 1- 4.
- Ashom, S.A., Tuleun, C.D. and Carew, S.N. (2016). Serum biochemical indices of finisher broiler chickens fed diets containing unprocessed and variously processed Roselle (*Hibiscus sabdarifa* L.) seed. *Nig. J. Anim. Sci.* (2): 356 – 363.

- Ayoka, A.O., Akomolafe, R.O., Akinsomisoye, O.S. and Ukponmwan, O.E. (2005). Medicinal and economic value of *Spondias mombin*. *Afr. J. Biomed. Res.*, 11: 129 – 136.
- Banergee, G.C. (2013). A text book of animal husbandry. Oxford and IBH publishing company Pvt. Ltd.
- Bush, B.M. (1991). Interpretation of laboratory results for small animal clinician. Black Well Scientific publications. London, United Kingdom. PP 32 – 67.
- Corthout, J., Peters, L.A., Claeys, M., Vanden-berghe, D.A. and Vlietinck, A.J. (1992). Antiviral caffeoyl esters from *Spondias mombin*. *Phytochem.*, 31: 317 – 320.
- Demoranville, V.E. and Best, M.A. (2013). Haematocrit. Encyclopedia of surgery. A guide for patients and caregivers. Available at: en.wikipedia.org/wiki/haematology.
- Emenalom, O.O., Esonu, B.O., Etuk, E.B. and Anaba, C. (2009). Effect of *Mucuna pruriens* (velvet bean) leaf meal on performance and blood composition of finisher broiler chickens. *Nig. J. Anim. Prod.*, 36(1): 52 – 60.
- Esonu, B.O., Emenalom, O.O., Udedibie, A.B.I., Anyanwu, G.A., Madu, U. and Inyang, A.O. (2005). Evaluation of neem (*Azadirachta indica*) leaf meal on performance, carcass characteristics and egg quality of laying hens. *Intl. J. Agric. Rural Devt.*, (6): 208 – 212.
- Esonu, B.O., Emenalom, O.O., Udedibie, A.B.I., Herbert, U., Ekpo, C.F. and Iheukweumere, F.C. (2001). Performance and blood chemistry of weaner pigs fed raw *Mucuna* (velvet bean) meal. *Trop. Anim. Prod. Invests.* 4: 49 – 54.
- Igwe, C.U., Ojiako, A.O., Nwaogu, L.A. and Onyeze, G.O.C. (2008). Lipid lowering effects of aqueous leaf extract of *Spondias mombin* Linn. *J. Pharmacol.*, 6(1): 1 – 9.
- Merck manual (2012). Haematologic reference ranges. Merck veterinary manual. Retrieved from <http://www.merckmanuals.com/>.
- Ochie, J. and Kolhatkar, A. (2000). *Medical Laboratory Science. Theory and Practice*. Tata McGraw-Hill company limited New Delhi.
- Okonkwo, V.N. and Esiegwu, A.C. (2017). Bambara seed offal meal as a replacement for soya bean meal on the haematological and serum biochemical indices of laying hens. *Int Journal of Agric. and Rural Dev.*, 20(1): 2997 – 2017.
- Okorie, K.C., Esiegwu, A.C. and Okonkwo, U.N. (2016). Evaluation of the growth performance, carcass characteristics and blood indices of broiler finishers fed graded levels of fermented *Mucuna sloanei* seed meal. *J. Trop. Agric, Food, Environ and Ext.*, 15: 39 – 44.
- Oladunmoye, M. K. (2007). Comparative evaluation of the effects of leaf extract from *Spondias mombin* on rats with induced infections from *Bacillus cereus* and *Clostridium sporogenes*. *Res. J. Phytochem.*, 1: 68 – 73.
- Onimisi, P.A., Ife, J.S., Oyebanji, R.S. and Moses, O. (2016). Evaluation of four commercial sources of synthetic methionine on the growth performance, carcass and meat quality of broiler chickens. *Nig. J. Anim. Sci.*, (2): 380 – 389.
- SPSS (2012). Statistical package for social sciences, version 21. USA IBM Corporation.
- Udedibie, A.B.I. and Opara, C.C. (1998). Response of growing broilers and laying hens to the dietary inclusion of leaf meal from *Alchoriacordifolia*. *Anim. Feed. Sci. Tech.*, 71: 157 – 164.
- Ukpabi, U.H., Mbachu, C.I. and Nwazue, B. (2015). Effect of inclusion of different levels of raw *Adenanthera pavonina* seed meal (RAPSM) on haematology and blood biochemistry of finisher broilers. *Nig. J. Anim. Sci.* 17 (1): 28 – 36.