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Effects of Air-Dried Neem Leaf Extract on the Hematology of Broiler Chicken

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Abstract

One hundred and sixty day-old broiler birds were used in a study conducted to investigate the effects of air-dried neem leaf extract (NLE) on the haematology of broiler chicken. The birds were randomly allotted into four treatment groups of 40 birds each in a completely randomized design (CRD). Treatment 1 received ordinary water and antibiotics while Treatments 2, 3 and 4 received 30, 40, and 50ml of 3% NLE in one litre of water, respectively without antibiotics. Results obtained in this experiment showed that packed cell volume and haemoglobin were significantly ($p < 0.05$) influenced by treatments only at the starter phase. Birds in the control diet had the highest and least values for lymphocytes and heterophil at the finisher phase. It was concluded that air-dried neem leaves extract could be used as an alternative to antibiotics without adverse effect on the blood profile of broiler chicken.

Keywords: Neem leaf extract, haematology, broiler chicken

Introduction

In Nigeria, a good number of different herbs and plants parts ranging from leaves meal and extracts, seeds, fruits and tree barks have been used in researches as alternatives to the conventional feeds, feedstuff, growth promoters and antibiotics. In some recent researches, *Aspilia africana*, *flamboyant seeds*, bitter kola, *Amarathuscruentus*, *Mucuna utilis*, *Azadirachta indica*, *Curcuma longa* and *Cinnamomum zylanicum* and host of others have been successfully used as supplement to enhance the health and performance of livestock particularly monogastric animals including poultry (Rahman *et al.*, 2014).

Neem tree is a widely researched tree that has attracted worldwide recognition due to its vast range of medicinal potentials like antibacterial, antiviral, antifungal, Antiprotozoal, Hepatoprotective and anti-coccidial effect in broilers and used as a pesticide (Akpan *et al.*, 2008). Various other properties have been documented in respect of its many bioactive components (Akpan *et al.*, 2008) that may also influence haematological and serum biochemical parameters in animals. Growth performances and blood profiles are important indices of the physiological state of animals (Khan and Zafer, 2005). Serum biochemistry and haematological features have attracted many researchers in order to make clinical predictions of the health status of animals, birds and even humans. The blood picture varies with certain conditions such as stress, infections and toxicity and blood constituents provide valuable media for clinical investigations and nutritional evaluation (Khan and Zafer, 2005).

Therefore, the present study is designed with the main objective of determining the effect of neem leaf extract on the haematology of broiler chickens.

Materials and Methods

The experiment was carried out at the poultry unit of the Directorate of University Farm of the Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. The area lies on latitude 7° 10' N and longitude 3° 2'E, it received a mean precipitation of 1037mm per annual an average temperature of 34.7°C and an average relative humidity of 82% throughout the year (Google Earth, 2017).

Fresh neem leaves were air dried for five to seven days until they are properly dried. One litre of boiled water was added to 30g of the air-dried neem leaf to attain the desired concentration level i.e. 3% concentration level for five hours. The prepared extract was further diluted at the rates 0, 30, 40 and 50ml in one litre of water. A total of one hundred and sixty broiler chickens were used for the experiment. The 3% concentrated neem leaf extract was further diluted at varying levels to form a lesser concentration that was served to the birds. The dilution rates were 0, 30, 40 and 50mls in one litre of water to form four levels of concentration. The one hundred and sixty chicks were randomly allotted to four treatments using completely randomized design (CRD). Each treatment was subdivided into four replicates of 10 chicks each. Diet composition is presented in Table 1.

A bird from each replicate was marked for sample collection on the two occasions (starter and finisher phases) and blood was collected from the jugular vein of the bird using a 5ml needle and syringe to collect

samples. Blood sample collected with the syringe was emptied into plain bottle (without anticoagulant) and EDTA bottle (with anticoagulant) to test for haematology and serum biochemistry respectively.

Table 1: Percentage composition of experimental diets (%)

Ingredients	Starter	Finisher
Maize	47.00	33.50
Soyabean Meal	18.50	16.50
Fish Meal	2.00	0.40
Groundnut Cake	17.50	13.80
Wheat Offal	10.00	10.80
Bone Meal	3.00	3.00
Oyster Shell	1.00	1.00
Vitamin Premix	0.25	0.25
Methionine	0.25	0.25
Lysine	0.25	0.25
Salt	0.25	0.25
Total	100	100
Calculated analysis		
Crude protein (%)	23.00	20.10
Crude fibre(%)	3.61	3.51
Ether extracts(%)	4.04	3.88
Metabolisable energy (MJ/Kg)	11.47	11.62

Results and Discussion

The effect of neem leaf extract (NLE) on the haematological parameters of broiler chicks is shown in Table 2. There were no significant ($p>0.05$) differences observed in most of the haematological parameters measured in the starter phase with the exception of packed cell volume and haemoglobin count of the blood. Packed cell volume (PCV) of broiler chicks on 30mls of neem leaf extract administration were similar to the chicks on 0mls and birds administered with 50mls. The highest PCV value was noticed in the birds exposed to 30mls of neem leaf extract while the lowest was noticed in the birds on 40mls of neem leaf extract. Haemoglobin concentration was highest ($p<0.05$) in birds administered with 30mls of NLE while the least value (8.30g/dl) was recorded in birds that were on 40mls of NLE. It was also noticed that white blood cell decreased numerically as the level of NLE inclusion increased. The effect of neem leaf extract (NLE) on haematological parameters of finisher broiler chickens is shown in

Table 3. There were no significant ($p>0.05$) differences observed in the majority of the haematological parameters measured in the finisher phase with the exception of Heterophil and Lymphocyte. The birds on 30mls of NLE had the highest heterophil value (32.67%) which decreased with increase in the NLE inclusion. However, the trend was opposite in the case of lymphocytes where the value increased with increased level of NLE inclusion. The birds on control diet had the least value of heterophil but highest value of lymphocytes. Birds on 40mls and 50mls of NLE recorded similar values of heterophil.

Table 2: Effect of Neem leaf extract on haematological parameters of starter broiler chickens

Parameters	0mls	30mls	40mls	50mls
Pack cell volume (%)	31.33±0.88 ^{ab}	34.33±0.67 ^a	28.00±2.08 ^b	31.33±0.33 ^{ab}
Haemoglobin (g/dl)	9.10±0.50 ^{bc}	10.47±0.12 ^a	8.30±0.26 ^c	9.77±0.09 ^{ab}
Red blood cell ($\times 10^{12}$ /l)	2.53±0.27	2.73±0.17	2.27±0.22	2.47±0.09
White blood cell ($\times 10^9$ /l)	13.83±0.26	13.53±1.44	12.43±0.44	12.03±0.67
Heterophil (%)	32.67±2.19	33.00±1.00	35.67±4.84	34.00±1.53
Lymphocyte (%)	66.00±2.00	65.67±0.88	62.33±3.84	64.67±2.03
Eosinophil (%)	0.33±0.33	0.33±0.33	0.67±0.33	0.00±0.00
Basophil (%)	0.00±0.00	0.33±0.33	0.33±0.33	0.00±0.00
Monocyte (%)	1.00±0.00	0.67±0.33	1.00±0.58	1.33±0.88
MCV (μm^3)	126.67±14.50	126.39±6.05	124.19±5.41	127.28±3.76
MCH (pg)	36.60±3.56	38.58±2.21	37.12±2.82	39.71±1.64
MCHC (%)	29.00±0.84	30.50±0.43	29.83±1.32	31.18±0.60

^{a,b,c} Means on the same row with different superscripts are significantly (P<0.05) different.

MCV (Mean Corpuscular Volume); MCH (Mean Corpuscular Hemoglobin); MCHC (Mean Cell Hemoglobin Concentration).

Table 3: Effect of Neem leaf extract on haematological parameters of finisher broiler chickens

Parameters	0mls	30mls	40mls	50mls
Pack cell volume (%)	33.33±0.67	33.33±1.67	34.00±1.15	31.67±0.67
Haemoglobin (g/dl)	10.80±0.12	10.47±0.50	10.87±0.52	10.07±0.39
Red blood cell (x10 ¹² /l)	1.83±0.12	2.20±0.20	2.30±0.21	1.93±0.19
White blood cell (x10 ⁹ /l)	11.67±0.79	11.87±1.09	12.10±0.56	11.23±0.69
Heterophil (%)	17.67±2.03 ^b	32.67±2.67 ^a	24.67±2.03 ^{ab}	24.67±2.03 ^{ab}
Lymphocyte (%)	78.00±0.58 ^a	66.33±2.33 ^b	70.67±0.67 ^{ab}	73.00±2.08 ^{ab}
Eosinophil (%)	1.67±0.88	0.33±0.33	2.00±0.58	0.33±0.33
Basophil (%)	0.67±0.33	0.67±0.67	1.33±0.33	1.00±0.00
Monocyte (%)	2.00±1.00	0.00±0.00	1.33±0.67	1.00±0.58
MCV (um ³)	183.82±15.35	155.09±20.57	149.60±10.79	167.04±17.32
MCH (pg)	59.38±3.61	48.56±5.81	47.72±3.18	52.93±5.11
MCHC (%)	32.42±0.74	31.41±0.43	31.93±0.45	31.78±0.95

^{a,b} Means on the same row with different superscripts are significantly (P<0.05) different.

MCV= Mean Corpuscular Volume; MCH= Mean Corpuscular Haemoglobin

MCHC= Mean Cell Haemoglobin Concentration.

The values recorded for the pack cell volume at both phases were similar to values reported by Bonsu *et al.* (2012) who fed diets containing varying levels of neem leaf meal. The values reported by Makanjuola *et al.* (2014) who used *Moringa oleifera* leaf meal as a substitute for antibiotics on the performance and blood parameters of broiler chickens were also similar to the values obtained in this present study. Haemoglobin recorded by all the groups was also within the normal range for chicken (Okeudo, 2003). These findings were in agreement with Nagalakshmi *et al.* (1996) who opined that neem possesses strong influence on the haematological traits in broilers particularly haemoglobin. This indicates that these animals were not stressed by the leaf extract.

The values of these blood parameters obtained from birds fed neem leaf extract may indicate better nutrient availability and utilization by the birds. This suggests that the birds were properly nourished and were able to obtain essential amino acids and minerals necessary for the normal functioning of the haematopoietic tissues. The reduction of lymphocyte counts in birds administered with neem leaf extract when compared with their counterpart in the control group indicate that there is a form of infection but was controlled by the neem leaf extract as it possesses potent immune-stimulant activity (Alok *et al.*, 2011). Heterophils count usually indicates the severity of the initial immune response. The increased heterophil values observed in the present study due to the administration of neem leaf extract confirm the finding of Esonu *et al.* (2006), Bonsu *et al.* (2012) and Nayaka *et al.* (2013) who reported that neem leaf meal has the potential to increase immunity of birds against infection.

Conclusion

It could be concluded that the use of air-dried neem leaf extract could be used as an alternative to antibiotics without any detrimental effect on the blood profile of broiler chicken.

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