

HAEMATOLOGICAL PROFILES OF BROILER CHICKENS ADMINISTERED VARYING LEVELS OF MORINGA (*Moringa oleifera*) ETHANOLIC PLANT EXTRACTS

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ABSTRACT

Medicinal plants, since times immemorial, have been used to cure a lot of diseases ranging from bacterial, protozoan and viral infections. This experiment was carried out to access and evaluate the effect of *Moringa oleifera* ethanolic extract on the haematological parameters of broiler chickens. A complete randomized design was used for the experiment with a total of one hundred and eight (108) day-old broiler birds assigned to six experiment groups with 18 birds/group and each group having three (3) replicates of six (6) birds each. The results obtained during the first and the second blood samplings showed significant ($P \leq 0.05$) difference in values of Mean cell volume (MCV), Mean Cell Haemoglobin (MCH), Haemoglobin (HB), RBC (red blood cell), LYM (Lymphocytes), ESR (erythrocyte sedimentation rate), MCHC (Mean cell haemoglobin concentration) and HET (heterophil). The result showed that the administration of *Moringa oleifera* extract improved the haematological parameters of broiler chickens, thereby enhancing their health status. Based on these findings, it is recommended to supplement *Moringa oleifera* in the feed and drinking water of broiler chickens to act as a prophylaxis against poultry diseases and to enhance their growth and performance.

Keywords: *Moringa Oleifera*, Haematology, Broiler, Plant Extract

INTRODUCTION

Medicinal plants have been used for centuries across various cultures as a primary source of medicine. The widespread use of herbal remedies and healthcare preparations, as documented in ancient texts like the Vedas and the Bible, can be attributed to the presence of natural compounds with medicinal properties (UNESCO, 1996). *Moringa oleifera* is reported to have various medicinal properties (Matthew *et al.*, 2001) such as possession of hypocholesterolemic properties and impaction of carotenoid compound into the poultry muscle (Olugbemi *et al.*, 2010). These plants have been utilized to treat numerous diseases, including bacterial, protozoan, and viral infections. They are believed to be effective in curing illnesses in both humans and other animal species. In recent years, medicinal plants have gained renewed popularity due to the growing demand for alternative treatments, driven by concerns over the declining effectiveness of conventional medicine.

Medicinal plants serve both preventive and therapeutic purposes in human and animal healthcare. They are widely acknowledged for their role in preventing and treating cardiovascular diseases, such as lowering blood pressure, preventing atherosclerosis and heart diseases, reducing serum cholesterol and triglycerides, inhibiting platelet aggregation, and enhancing fibrinolytic activity (Chan *et al.*, 2013). Recently, medicinal plants have also been incorporated into livestock production (UNESCO, 1998). In addition to these benefits, medicinal plants are used to treat a variety of conditions, including digestive, respiratory, reproductive, urinary, and mental disorders in both humans and animals. They have also been shown to cause slight reductions in both systolic and diastolic blood pressure in animals (Sial and Ahmed, 1982).

Medicinal plants are widely used in pharmaceuticals, nutraceuticals, cosmetics, and food supplements, as well as in traditional medicine, due to their anti-tumor, anti-arthritis, and anti-thrombotic properties (Thomson *et al.*, 2002). The growing demand for medicinal plants has been embraced by many countries because of their affordability, availability, and diverse benefits, including improving performance, growth rate, feed conversion efficiency, and weight gain in poultry (Lewis *et al.*, 2003). These plants have been tested against various livestock diseases. This study was conducted to evaluate the effectiveness of *Moringa oleifera* as an alternative medicinal plant for disease prevention, treatment, and therapy in poultry.

MATERIALS AND METHODS

Study Area

This study was carried out at the poultry sub-unit of the Teaching and Research Farm of the Federal University of Technology, Akure located at the back of department of Animal Production and Health Obaekere, Akure. The study lasted for a period of eight (8) weeks.

Experimental Animals

A total of one hundred and eight (108) broiler birds of mixed sexes were used in the experiment. The breed of the broiler birds is Marshall, the broiler birds were collected at day-old from RTO Hatchery Ilobu road, Oshogbo, Osun State.

Sample Collection

Moringa (*Moringa oleifera*) plant was collected from farms, gardens and plantation of friends and family at Oshinle quarters, Sijuwade, Ijoka, Alagbaka quarters and Federal University of Technology Akure (FUTA) crop farm in Akure South local government area of Ondo State. The plant was identified by the botanist working as a laboratory technologist at the department of crop, soil and pest management, Federal University of Technology Akure.

Experimental Layout

A total of one hundred and eight (108) day-old broiler birds assigned to six treatments with 18 birds per treatment with each treatment having three (3) replicates of six (6) birds each. There were six (6) birds per replicate and 3 replicates per treatment. Brooding of the birds was carried out at the experimental units of Animal production and Health Department using deep litter system.

A complete randomized design was used for the experiment. Six (6) experimental treatments of which birds in four of the treatments received extracts of different concentration levels of the plant (10ml/litre and 20ml/litre respectively), while the two other treatments (control group) were not given extracts. The extract administered birds were further divided into vaccinated and unvaccinated sub groups. The treatments were replicated three times with six birds per replicate.

Preparation of Extract

The *Moringa oleifera* leaf was air-dried for two weeks, moisture content of the Moringa leaves is consistent with the method of Mbah *et al.* (2012), who processed Moringa leaves through sun-drying and shade drying methods. This was followed by grinding with the aid of a grinder then pulverized into powder. Three hundred gram (300g) of fine powder was soaked in 300ml of ethanol for 3 days (72 hours) before it was being filtered. The filtrate was poured in a rotary evaporator to separate the extract and ethanol. The extract obtained were dried, frozen and stored in the refrigerator until use. Ethanolic extraction method was used to extract the plant, 85% ethanol was used in the extraction, after which muslin cloth was used to extract the liquid out, and it was later air-dried then weighed again and stored in the refrigerator.

Table 1: Experimental Design/Layout

TREATMENT	EXTRACT LEVEL	VACCINATION
T ¹	20ml	Vaccinated
T ²	20ml	Unvaccinated
T ³	10ml	Vaccinated
T ⁴	10ml	Unvaccinated
AT ⁹	20ml	Vaccinated
BT ⁹	10ml	Vaccinated
AT ¹⁰	20ml	Unvaccinated
BT ¹⁰	10ml	Unvaccinated
TC ¹	No extract	Vaccinated
TC ²	No extract	Unvaccinated

LEGEND: T^Z = Experimental treatments, vaccinated and unvaccinated
 AT^Z = Experimental treatments, vaccinated
 BT^Z = Experimental treatments, unvaccinated
 TC^Z = Control, no extract, unvaccinated

Experimental Treatment

200g of the extract was dissolved into 1000ml (1 litre) distilled water to form a stock from which 10 ml and 20ml of the stock was further added into 1 litre of water each for the administration to the birds. In assigning the birds into treatments; they were weighed six (6) birds per replicate. The birds were fed *ad-libitum* throughout experimental period, during which the weekly records of birds' weights, feed consumption, water intake and blood samples were kept. At the end of each week, the weight gained as well as the feed intake were computed appropriately. The pen environment was kept clean throughout the experiment.

Blood Collection for Analysis

Blood samples were collected on three occasions during the experiment. The first blood sample was collected before vaccination and administration of the *Moringa oleifera* extract to know the baseline haematological indices of the birds. The second blood was collected after vaccination and administration of the *Moringa oleifera* extract to the birds, while the third blood was collected during the termination of the experiment (after administration of the *Moringa oleifera* extract). The birds were randomly selected per treatment, weighed and scarified by severing the jugular vein and blood allowed to flow freely into labelled bottles one of which contained a speck of Ethylene diamine tetra-acetic acid (EDTA) while the other without EDTA was processed for serum. The serum was kept deep frozen prior to analysis. The packed cell volume (PCV %) was estimated in heparinized capillary tubes in a haematocrit micro centrifuge for 5 min while the total red blood cell (RBC) count was determined using normal saline as the diluting fluid. The haemoglobin concentration (HB) was estimated using cyano-methaemoglobin method while the mean corpuscular haemoglobin concentration (MCHC), mean corpuscular haemoglobin (MCH) and the mean corpuscular volume (MCV) were calculated (Mitruka and Rawnsley, 1998).

Analysis of Data

All data collected were analysed using SPSS Package 16.0 (2007), differences among the means were separated using Duncan Multiple Range Test as described by Silva and Azevedo (2009).

RESULTS AND DISCUSSION

The results of haematological parameters of the broiler chickens administered ethanolic extract of *Moringa oleifera* at 20ml and 10ml are shown in Tables 2 and 3 below.

TABLE 2: Haematological parameters of broiler birds at 4 weeks after the administration of two levels of ethanol extract of *Moringa oleifera*

Plant	Vac c	Co nc	ESR	PCV	RBC	HB	LYM	MCV	MCH	MCHC	HET	MON O	BAS	EOS
Morin ga			3.50± 0.60 ^b	26.09± 1.00 ^b	2.78± 0.15 ^b	8.69±0 .33 ^b	65.18± 0.26 ^a	96.07±2 .22	31.98± 0.73 ^b	33.29±0 .02 ^b	17.27± 0.48 ^b	12.59± 0.38	3.36± 0.10	1.64± 0.10
BASE LINE			6.91± 0.94 ^a	29.48± 1.47 ^a	2.42± 0.11 ^b	10.21± 0.28 ^a	60.70± 0.26 ^b	124.81± 5.94 ^a	43.17± 1.01 ^a	46.37±1 3.04 ^a	22.00± 0.42 ^a	12.35± 0.37	3.26± 0.09	1.70± 0.10
Water	Un vac	10	2.17± 0.40 ^c	30.00± 1.43 ^a	3.45± 0.18 ^a	10.00± 0.33 ^a	65.83± 0.31 ^a	87.51±1 .89 ^b	29.17± 0.62 ^b	33.33±0 .05 ^b	17.13± 0.54 ^b	12.17± 0.70	3.50± 0.22	1.50± 0.22
		20	2.55± 0.23 ^c	28.43± 0.68 ^a	3.12± 0.11 ^a	9.46±0 .23 ^a	65.71± 0.29 ^a	91.75±1 .18 ^a	30.52± 0.38 ^b	33.26±0 .02 ^b	16.43± 0.42 ^b	12.86± 0.47	3.43± 0.14	1.57± 0.14
	Vac	10	4.51± 1.16 ^b	24.40± 1.49 ^b	2.44± 0.21 ^b	7.98±0 .50 ^b	65.40± 0.43 ^a	101.34± 4.05 ^a	33.68± 1.32 ^b	33.24±0 .03 ^b	18.08± 0.68 ^b	11.80± 0.39	3.20± 0.13	1.60± 0.16
		20	2.75± 0.41 ^b	27.83± 1.17 ^a	3.07± 0.17 ^b	9.28±0 .39 ^a	65.00± 0.33 ^a	91.67±1 .49 ^a	30.55± 0.51 ^b	33.33±0 .03 ^b	16.67± 0.69 ^b	13.25± 0.57	3.50± 0.15	1.67± 0.14
Morin ga	Un vac	10	1.67± 0.67 ^d	30.00± 2.00 ^a	4.22± 0.32 ^a	9.97±0 .67 ^a	63.33± 0.33 ^a	71.26±1 .03 ^c	23.67± 0.33 ^c	33.22±0 .01 ^b	18.00± 0.58 ^b	14.00± 0.57	3.66± 0.33	1.00± 0.00
Morin ga	Un vac	20	1.33± 0.21 ^d	29.83± 1.66 ^a	4.27± 0.34 ^a	9.95±0 .55 ^a	63.00± 0.36 ^a	70.53±1 .82 ^c	23.52± 0.60 ^c	33.35±0 .04 ^b	20.66± 0.91 ^a	11.16± 0.74	3.33± 0.21	1.83± 0.17
Morin ga	Vac	10	2.00± 0.51 ^c	28.00± 1.46 ^a	3.87± 0.30 ^a	9.33±0 .49 ^a	62.83± 0.30 ^b	72.96±2 .15 ^c	24.32± 0.73 ^c	33.33±0 .04 ^b	18.50± 0.88 ^b	13.50± 0.76	3.33± 0.21	1.83± 0.17
Morin ga	Vac	20	2.33± 0.67 ^c	26.67± 1.76 ^b	3.45± 0.45 ^a	8.90±0 .59 ^b	63.00± 0.57 ^a	78.77±6 .27 ^c	26.29± 2.07 ^c	33.37±0 .04 ^b	20.33± 2.02 ^a	11.66± 1.76	3.33± 0.33	1.67± 0.33
Water	Un vac	0	2.00± 1.00 ^c	29.50± 4.50 ^a	4.04± 0.78 ^a	9.80±1 .50 ^a	63.00± 0.00 ^a	73.61±3 .07 ^c	24.45± 1.00 ^c	33.21±0 .01 ^b	18.00± 0.00 ^b	13.50± 0.50	3.00± 0.00	2.00± 0.00
Water	Vac	0	1.67± 0.67 ^d	29.33± 2.02 ^b	4.14± 0.33 ^a	9.80±0 .66 ^a	63.00± 0.57 ^a	71.06±1 .00 ^c	23.74± 0.35 ^c	33.41±0 .04 ^b	18.66± 1.33 ^b	13.66± 1.20	3.33± 0.33	1.33± 0.33

a, b, c, d= means on the same row but with different superscripts are statistically ($P \leq 0.05$) significant different.

ESR = erythrocyte sedimentation rate, PCV = packed cell volume. LYM = lymphocyte, HET=Heterophil, MONO= monocyte, BAS= basophil, EOS= eosinophil, MCV= mean cell value, MCHC= Mean cell haemoglobin concentration, MCH= mean cell haemoglobin, RBC= red blood cell, HB= haemoglobin

Table 3: Haematological parameters of broiler birds at 8 weeks after the administration of two levels of ethanol extract of *Moringa oleifera*

Plant	Vacc	Conc	ESR	PCV	RBC	HB	LYM	MCV	MCH	MCHC	HET	MONO	BAS	EOS
Moringa			3.50±0.60 ^b	26.09±1.00 ^a	2.78±0.15 ^b	8.69±0.33 ^b	65.18±0.26 ^b	96.07±2.22 ^b	31.98±0.73 ^b	33.29±0.02 ^b	17.27±0.47 ^c	12.59±0.38	3.36±0.10	1.64±0.10
BASELINE			6.91±0.94 ^a	29.48±1.47 ^a	2.42±0.11 ^b	10.21±0.28 ^a	60.70±0.26 ^b	124.81±5.94 ^a	43.17±1.01 ^a	46.37±13.04 ^a	22.00±0.45 ^a	12.35±0.37	3.26±0.09	1.70±0.10
Water	Unvac	10	2.17±0.40 ^b	30.00±1.00 ^a	3.45±0.18 ^a	10.00±0.33 ^a	65.83±0.31 ^a	87.51±1.89 ^b	29.17±0.62 ^b	33.33±0.03 ^b	17.00±0.58 ^c	12.17±0.70	3.50±0.22	1.50±0.22
		20	2.50±0.23 ^b	28.43±0.68 ^a	3.12±0.11 ^a	9.46±0.23 ^a	65.71±0.29 ^a	91.75±1.18 ^b	30.52±0.38 ^b	33.26±0.02 ^b	16.43±0.42 ^c	12.86±0.47	3.43±0.14	1.57±0.14
	Vac	10	4.40±1.19 ^b	24.00±1.49 ^b	2.44±0.21 ^b	7.98±0.50 ^b	65.40±0.43 ^a	101.34±4.05 ^a	33.68±1.32 ^b	33.24±0.03 ^b	18.00±0.68 ^b	11.80±0.39	3.20±0.13	1.60±0.16
		20	2.75±0.41 ^b	27.83±1.17 ^a	3.07±0.17 ^a	9.28±0.39 ^a	65.00±0.33 ^a	91.67±1.49 ^b	30.55±0.51 ^b	33.33±0.03 ^b	16.67±0.62 ^c	13.25±0.57	3.50±0.15	1.67±0.14
Moringa	Unvac	10	3.33±0.01 ^b	24.33±0.77 ^b	2.56±0.12 ^b	8.10±0.26 ^b	65.50±0.56 ^b	95.56±1.46 ^b	31.81±0.47 ^b	33.29±0.03 ^b	16.33±1.38 ^c	13.33±0.92	3.33±0.22	1.50±0.21
Moringa	Unvac	20	3.00±0.40 ^b	26.00±0.89 ^b	2.79±0.12 ^b	8.68±0.31 ^b	64.67±0.51 ^b	93.55±1.29 ^b	31.24±0.39 ^b	33.40±0.05 ^b	17.67±0.73 ^c	12.33±0.80	3.50±0.22	1.67±0.20
Moringa	Vac	10	3.40±0.40 ^b	25.00±1.80 ^b	2.63±0.30 ^b	8.34±0.60 ^b	63.40±0.63 ^b	95.43±3.47 ^b	31.83±1.17 ^b	33.35±0.03 ^b	18.20±1.19 ^b	13.20±0.91	3.20±0.22	1.80±0.21
Moringa	Vac	20	2.83±0.01 ^b	26.50±0.33 ^b	2.83±0.12 ^b	8.82±0.13 ^b	65.00±0.33 ^a	95.42±2.43 ^b	31.75±0.76 ^b	33.27±0.08 ^b	17.00±0.88 ^c	12.83±1.15	3.50±0.33	1.67±0.33
Water	Unvac	0	3.00±0.33 ^b	28.33±1.45 ^b	3.15±0.25 ^b	9.43±0.47 ^b	65.67±0.58 ^a	90.03±2.36 ^b	29.97±0.84 ^b	33.29±0.07 ^b	16.67±0.88 ^c	13.00±0.67	3.33±0.33	1.33±0.33
Water	Vac	0	1.33±0.33 ^c	31.67±1.56 ^a	3.74±0.32 ^a	10.57±0.31 ^a	66.00±0.33 ^a	85.00±2.46 ^b	28.37±0.84 ^b	33.37±0.05 ^b	17.33±0.30 ^c	11.33±0.55	3.67±0.33	1.67±0.33

Mean ± standard Error of Mean a, b, c, d= means on the same row but with different superscripts are statistically (P≤0.05) significant different.

ESR = erythrocyte sedimentation rate, PCV = packed cell volume, LYM = lymphocyte, HET=Heterophil, MONO= monocyte, BAS= basophil, EOS= eosinophil, MCV= mean cell value, MCHC= Mean cell haemoglobin concentration, MCH= mean cell haemoglobin, RBC= red blood cell, HB= haemoglobin

The result showed the responses of the birds given varying levels of *Moringa oleifera* ethanol extract at the starter and finisher phases. The baseline haematological parameters of the broiler birds before the administration of *Moringa oleifera* extract and vaccination against Newcastle disease virus using NDV LaSota were within the normal range of haematological parameters of broiler chickens as presented by Mitruka and Rawnsley, (1998). The result on Table 2 (starter phase) showed significant (P ≤0.05) differences in values of Mean cell volume (MCV), Mean Cell Haemoglobin (MCH), Haemoglobin (HB), RBC (red blood cell), LYM (Lymphocytes), ESR (erythrocyte sedimentation rate), MCHC (Mean cell haemoglobin concentration) and HET (Heterophil) of broiler birds administered *Moringa oleifera* extract. The haematological indices measured were significantly (P ≤0.05) different among treatment groups during the starter phase (4 weeks) of the experiment. This result is in tandem with the findings of Rabia *et al.*, (2018); Meel *et al.*, (2018), who reported that broiler chickens fed Moringa leaf meal had higher levels of red blood cells (RBC) haemoglobin level (HB) than those who were not given. However, there were no significant (P ≥0.05) difference in the haematological parameters of MONO, BAS and EOS, this result is in tandem with the findings of Tijani *et al.* (2015) who reported that *Moringa oleifera* extract had no significant effect on monocytes (MONO) of broiler chickens.

The result on Table 3 (finisher phase) showed significant (P ≤0.05) differences in values of Mean cell volume (MCV), Mean Cell Haemoglobin (MCH), Haemoglobin (HB), RBC (red blood cell), LYM (Lymphocytes), ESR (erythrocyte sedimentation rate), MCHC (Mean cell haemoglobin concentration) and HET (Heterophil) of broiler birds administered *Moringa oleifera* extract. The haematological indices measured were significantly (P ≤0.05) different among treatment groups during the experiment. The values for MCV ranged from 124.81±5.94 to 88.00±2.46 which is highest at baseline and lowest at water vaccinated group. Tijani *et al.* (2015), reported that MCV are higher in broiler chicken fed *Moringa oleifera* extract. However, there were no significant (P ≥0.05) difference in the haematological parameters of MONO, BAS and EOS.

There was a significant (P≤0.05) difference in Packed Cell Volume (PCV) with value 26.50±0.33 of Moringa 20ml group, this is in tandem with the findings of Nouala *et al.* (2006) who reported that *Moringa oleifera* leaves increases PCV value in poultry birds. The blood variables most often affected by dietary influences were identified as Packed Cell Volume (PCV), plasma protein, glucose and clotting time (Ologhobo *et al.* 1986). Tables 2 and 3 showed no significant (P≥0.05) difference in the haematological parameters of vaccinated group compared to the unvaccinated group, the baseline haematological parameters tend to be higher than that of the vaccinated and unvaccinated groups. This may however be as a result of outbreak of poultry disease and infection which negatively affected the haematological parameters of broiler birds.

The haematological parameters increase in the finisher stage (Table 3) compared to the starter stage (Table 2). The values obtained for most of these haematological indices were similar and generally agreed with standard values

obtained in previous studies (Aletor, 1987; Aletor and Egberongbe, 1992). The ESR of birds administered different levels of *Moringa oleifera* ethanolic extract diets were similar to the control indicating that the extract did not predispose the birds to any known general infection or malformation of any kind. It has been reported that Erythrocyte Sedimentation Rate (ESR) are increased in cases of acute general infection, malignant tumours and pregnancy (Frandsen, 1986). Ghasi *et al.* (1999) and Ewuola *et al.* (2011), also reported that crude extract from *Moringa oleifera* leaves was found to be a potent hypocholesterolemic agent. These values in the experimental birds were found to be consistently higher than most values earlier reported and comparable with the report for chickens fed Soya bean in place of fish meal (Aletor and Egberongbe, 1992).

CONCLUSION AND RECOMMENDATION

The result of this study showed significant difference in the haematological parameters of the broiler birds measured between the different treatment groups. The administration of *Moringa oleifera* extract improved the haematological parameters of the broiler birds thus improving their resistance to diseases. *Moringa oleifera* could be a good alternative for substituting drugs, vaccines and commercial rations for livestock. It is therefore recommended that *Moringa oleifera* should be incorporated into the feed and water of broiler birds for improved performance as the study showed that *Moringa oleifera* is an immune booster for the broiler chicken.

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