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PERFORMANCE AND HAEMATOLOGICAL PROFILE OF BROILER CHICKENS FED DIETS CONTAINING, MORINGA (*Moringa oleifera*) LEAF, NEEM (*Azadiracta indica)* LEAF OR BITTER LEAF (*Vernonia amygydalina*) MEAL

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ABSTRACT

An experiment investigating the Performance and Haematology of broilers fed moringa leaf, neem leaf or bitter leaf meal was carried out in the teaching and research farm of the Prince Abubakar Audu University Anyigba, Kogi State Nigeria. Fresh moringa, neem and bitter leaf were collected from the Prince Abubakar Audu University Livestock farm premises. The samples were dried under shade for 14 days and ground into powder using a hammer mill and used for the experiment. One hundred and twenty (120) day-old broiler chickens used for the experiment were brooded for two weeks then weighed and randomly allocated to four experimental treatments in a Completely Randomized Design (CRD). Each of the treatments contained thirty (30) birds with three replicates of ten (10) birds. Moringa, neem or bitter leaf were then incorporated into the experimental diets at 0.05% inclusion level and were defined as T2, T3 or T4 respectively, while T1 was designated as the control diet which contained no phytogenic plant. Data were collected for the growth performance and haematological indices. Result obtained showed significant differences (P<0.05) in final weight, weight gain, daily weight gain, daily feed intake, and feed conversion ratio. Final weight and weight gain showed significant increase in values with the inclusion of the phytogenic feed additive. Ranges of 1795.19 g to 2281.62 g and 1333.95 g were obtained in the final weight and weight gain respectively. Daily feed intake and FCR values ranged from 96.55 g to 115.53 g and 2.80 to 3.04 respectively. Haematological showed significant Packed cell volume values ranged from 30.08% to 33.27%, Heamoglobin values ranged from 8.0 to 10.34g/dl. Obtained range for white blood cell values were 215.64 to 229.28 $x10^9$/L. Red blood cell ranges from 2.90 – 3.54$x10^{12}$/L. while mean corpuscular volume value ranges from 121.13 to 123.83fl. Mean corpuscular haemoglobin range from 37.42 to 41.33pg. Mean corpuscular haemoglobin concentration value ranged from 32.13 to 33.13g/dl. Values for neutrophils and lymphocyte range from 2.60 to 4.21% and 95.33 to 98.00% respectively. It was concluded that Vermonia amygdalina or Azardiracta indica should be added at an inclusion rate of 0.50% in broilers chickens' diets for improved growth performance and haematological indices of the chickens.

Keyword: bitter leaf, neem, moringa, performance, haematology, broilers,

1.0 INTRODUCTION

Poultry is a major agro-business enterprise with capacity to alleviate the animal protein deficiency in developing countries (Onibi *et al*., 2009). They are good converters of feed into protein in meat and egg (Agbabiaka*et al*., 2012). The poultry industry can be adopted under a wide range of climatic conditions and can generally be combined conveniently with other farm enterprises. A huge gap however exists between availability and requirement of poultry products which is due to the slow growth in the poultry sector for the past two decades (Singh, 2010). Unfortunately, this enterprise is facing series of constraints including disease outbreak which invariably affects their productivity of poultry (Dalloul *et al*., 2006).

The mechanism of action of antibiotics as growth promoters varies, but positive effect can be observed through improved appetite, feed conversion, stimulation of the immune system and increased vitality, regulation of the intestinal micro flora, etc. (Dalloul *et al*., 2006). Phytogenic plants are very commonly used additives in broiler diets (Zhang *et al.* 2009). Supplementation with herbal plants could have many benefits to broiler health due to their phytochemical effects (anti-oxidative, antibiotic, antihermit etc.) (Dinh, 2006). Dorman and Deans (2000) reported that this phytochemical effect of utilization of phytogenic feed additives includes enhancing digestion by stimulating endogenous enzymes and thereby improving growth.

The effect of reduced growth and poor economic return due to poor haematology indices values of broiler chickens have been a major challenge in the poultry industry. Huge economic losses have been experienced due to this effect high susceptibility to infectious parasites. Control of these parasites like *Emiria spp* have been reported to improve the homeostasis of the chickens. This therefore necessitates the utilization of phytogenic plants like fed moringa (*Moringa oleifera*), neem (*Azadiracta indica*) and bitter leaf (*Vernonia amygdalina*) meal to reduce these challenges. However, the effect of these plants on the performance and physiological indices needs to be evaluated for improved performance and physiology of the broiler chickens without the accompanying health concern of antibiotic use.

The objectives of this study were to:

- Determine the growth performance of broilers fed moringa (*Moringa oleifera*), neem (*Azadiracta indica*) or bitter leaf (*Vernonia amygdalina*) meal in the diet.

- To investigate the Haematological indices of finisher broilers chickens fed moringa (*Moringa oleifera*), neem (*Azadiracta indica*) or bitter leaf (*Vernonia amygdalina*) meal in the diet.

2.0 MATERIALS AND METHODS

2.1 Experimental Site

The study was conducted at the Poultry Unit of the Teaching and Research Farm of the Department of Animal Production, Faculty of Agriculture, Prince Abubakar Audu University, Anyigba in Dekina Local Government Area of Kogi State.

2.2 Collection, Processing and Preparation of the Experimental Diet

Fresh moringa (*Moringa oleifera*), neem (*Azadiracta indica*) and bitter leaf (*Vernonia amygdalina*) were collected from the Prince Abubakar Audu University Livestock Unit premises. The samples were dried under shade for 14days and ground into powder using a hammer mill at Anyigba market. The obtained powder was packed in separate polyethylene bag and preserved in the feed storage room until used in compounding the experimental diets. Other ingredients like maize, soybeans, maize offal, fishmeal etc. used for the compounded diets were purchased from the Anyigba market.

2.3 Experimental Design and Management of Birds

One hundred and twenty (120) day-old broiler chickens were used for the experiment. The birds were brooded for two weeks before the commencement of the experiment. On the fourteenth day, the birds were weighed and randomly allocated to four experimental treatments in a Completely Randomized Design (CRD). Moringa (*Moringa oleifera*), neem (*Azadiracta indica*) or bitter leaf (*Vernonia amygdalina*) were then incorporated into the experimental diets at 0.05% inclusion level

and were defined as T2, T3 or T4 respectively, while T1 was designated as the control diet which contained no phytogenic plant. Each of the treatments contained thirty (30) birds with three replicate of ten (10) birds each which were raised on deep litter system. The experiment lasted for six weeks, Feed and drinking water were provided *ad libitum* and standard routine management practices followed.

Table 1: Percentage Composition of Starter Broilers' Experimental Diet Containing moringa, neem and bitter leaf meal

Ingredients	Diet 1	Diet 2	Diet 3	Diet 4
Maize	40.50	40.00	40.00	40.00
Neem leaf	0.00	0.50	0.00	0.00
Moringa leaf	0.00	0.00	0.50	0.00
Bitter leaf	0.00	0.00	0.00	0.50
FFSB	43.0	43.00	43.00	43.00
Maize Offal	10.00	10.00	10.00	10.00
Bone Meal	3.50	3.50	3.50	3.50
Salt	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10
Premix	0.25	0.25	0.25	0.25
Fishmeal	2.30	2.30	2.30	2.30
Total	100.00	100.00	100.00	100.00

2.4 Data Collection

2.4.0 Performance Data

2.4.1 Initial Body Weight

This was determined by weighing the birds per replicate at the beginning of the experiment. Values obtained were recorded as the initial weight of the birds.

2.4.2 Weight Gain

This was determined by subtracting initial weight from final weight of the birds and values obtained recorded as weight gain of the birds.

2.4.3 Average Daily Weight Gain

Average daily weight gain was determined by dividing weight gain by the number of birds and the number of days of the feeding trial.

2.4.4 Daily Feed Intake

This was determined by subtracting the leftover from the quantity of feed offered.

Feed Intake = Feed Offered−Leftover Feed.

2.4.5 Feed Conversion Ratio

This was computed for each replicate during the feed trail as indicated below

$$\text{Feed conversion ratio (FCR)} = \frac{\text{Daily feed intake (g)}}{\text{Average daily weight gain (g)}}$$

2.4.6 Haematological analysis

At the end of the trial, two birds per replicate were randomly selected for blood collection. Blood samples were collected through the wing vein into EDTA bottles for haematological evaluation. The haematological parameters evaluated are: red blood cells (RBC), haemoglobin (Hb), packed cell volume (PCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), mean corpuscular volume (MCV) and white blood cell (WBC), neutrophil and lymphocytes, monocyte, eosinophil, basophils.

2.5 Statistical Analysis

All data were subjected to analysis of variance (ANOVA) using the Statistical Package for Social Science (2007) version 19, and significant differences between means were separated using the fisher's least significance difference (LSD).

3.0 RESULTS AND DISCUSSION

3.1 Results

Table 2 Proximate composition of experimental diets

Parameters	Control	Moringa	Bitter leaf	Neem Leaf
Moisture	10.21	9.85	10.04	10.69
Crude Protein	24.02	23.98	23.73	24.00
Ether Extract	9.64	9.64	9.84	9.64
Crude Fibre	4.11	4.11	4.10	4.09
Ash	2.47	2.39	2.54	2.49
Nitrogen free extract	49.55	50.03	49.75	50.91
Lysine	1.22	1.22	1.22	1.22
Methionine	0.39	0.39	0.39	0.39
Cysteine	1.21	1.21	1.21	1.21

3.1.1 Performance Characteristics of Broiler Chickens Fed Moringa, Neem or Bitter Leaf meal

The effect of feeding Moringa, Neem or Bitter Leaf meal on the performance of broilers is presented in Table 1. Observed results show no significant differences ($P>0.05$) in initial weight. However, there were significant differences ($P<0.05$) in final weight, weight gain, daily weight gain, daily feed intake, and feed conversion ratio. Value range of 448.90 g to 461.42 g were obtained for bitter leaf and control diet fed birds respectively for the initial weight. Final weight showed significant increase in values with the inclusion of the phytogenic feed additive. Range of 1795.19 g to 2281.62 g was obtained for the control and bitter leaf fed birds respectively for the final weight. Gross weight gain however had a value of 1333.95 g for the control which was significantly lower than birds fed *Moringa oleifera* leaf meal with a value of 1500.45 g and neem leaf fed birds with a value of 1507.79 g. However, the bitter leaf fed birds had the highest value of 1732.72 g for weight gain. Daily feed intake showed significant variation with the highest significant ($p<0.05$) value obtained in the bitter leaf fed birds. Value range obtained for daily feed intake ranged from 96.55 g obtained in the control fed birds to 115.53 g obtained in the bitter leaf fed birds. Feed conversion ratio value also show significant higher value of 3.04 in the control diet fed bird. However no significant ($p>0.05$) variation was obtained with the different phytogenic

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additives. Values range of FCR were 2.80 to 3.04 obtained respectively from the birds fed bitter leaf and control diet respectively.

Table 3: Performance of Broilers Fed Moringa, Neem or Bitter Leaf meal

Parameters	Control	Moringa	Bitter leaf	Neem Leaf	SEM	LOS
Initial weight (g)	461.24	455.62	448.90	458.74	2.94	NS
Final weight (g)	1795.19^{c}	1956.07^{b}	2281.62^{a}	1966.53^{b}	52.51	*
Weight gain (g)	1333.95^{c}	1500.45^{b}	1732.72^{a}	1507.79^{b}	51.06	*
Daily weight gain(g)	31.76^{c}	35.73^{b}	41.26^{a}	35.90^{b}	1.14	*
Daily feed intake (g)	96.55^{b}	102.18^{b}	115.53^{a}	104.47^{b}	7.09	*
Feed conversion ratio	3.04^{a}	2.86^{b}	2.80^{b}	2.91^{b}	0.12	*

^{abcd} Means with different superscript along the same rows show significant difference at p>0.05, * = significantly different, SEM= Standard Error of the Mean. NS= Not significant, LOS= level of significant

Final weight and weight gain values of 1795.19 and 1333.95 g were obtained in the control diet fed birds. This was accompanied with an increasing trend in values of final weight and weight gain among birds fed the feed additive dietary treatments with significant ($p<0.05$) higher values of 2281.62 g and 1732.72 g obtained in the birds fed bitter leaf diets respectively. However, the weight of the broiler chickens fell within ranges of 1500 g to 2200 g for final average weight of broilers raised in Nigeria according to Dafwang (1995). There was however a significant ($p<0.05$) lower feed intake in broiler chickens fed the control dietary treatment. Gakuya *et al.* (2014) reported a decrease in intake for birds fed *Moringa oleifera* leaf meal in relation to weight when compared to the control diet fed broiler chickens. Reports by Aderemi *et al.* (2006) confirm the scientific evidence that birds eat to satisfy their energy requirement. This could imply that the high consumption of the birds fed bitter leaf might be due to the bird's nutrient requirement which is

directly proportional to their size, therefore higher feed was required to meet their maintenance requirement. This position is further emphasized by Pinchasov and Gallili (1990) who reported that the body nutrient requirement of commercial bird is proportional to their body weight. Ehebha and Eguaoje (2018) reported that utilization of *V. amygdalina* has some beneficial effects in disease management of poultry, such as its anti-coccidiosis, anti-bacterial and anti-parasitic properties thereby decreasing the parasitic microbes in the gastro intestinal tract (GIT) of birds, confers improved health which stimulates growth in the broiler chickens. Reports by Ogbuewu *et al*. (2010) revealed that the maintenance of growth in poultry requires nutritionally balanced ratio both in quality and quantity. This observation agrees with the reports of Esonu *et al*. (2006) and Obikaonu *et al*. (2011) who reported that broilers only consumes about 3 to 5% of their body weight/day.

Birds fed the control diet had the highest feed conversion ratio value of 3.04. Values of 2.86, 2.80 and 2.91 were respectively obtained for the birds fed *Moringa olefera*, *V. amygdalina* and *Azardiracta indica* respectively. This implied that better feed utilization were obtained in the birds fed the feed additives. Values obtained were in line with the value range of 2.97 to 3.20 reported by Odoemelam *et al.* (2013) with the inclusion of bitter leaf in broiler diets leading to improvement in body weight with reduced intake. Tarek *et al.* (2013) reported FCR values of 2.82 to 3.04 for finisher broilers fed diets containing bitter leaf meal. Average value of 2.94 was reported for FCR when broiler starter chickens were exposed to diets containing *Moringa oleifera* leaf meal (Donkor *et al*., 2013).

3.1.2 Haematological indices of broiler chicken fed diets containing Moringa, bitter leaf or neem leaf.

The effect of feeding diets containing Moringa, bitter leaf or neem leaf on the haematology of broiler chickens is presented in Table 2.

The result of the haematological test shows significant ($P<0.05$) difference for all parameters analyzed except for the mean corpuscular volume and mean corpuscular haemoglobin

concentration. Packed cell volume values ranged from 30.08% to 33.27%, Heamoglobin values ranged from 8.0 to 10.34g/dl. Obtained range for white blood cell values were 215.64 to 229.28 $x10^9$/L. Red blood cell ranges from 2.90 – 3.54$x10^{12}$/L. while mean corpuscular volume value ranges from 121.13 to 123.83fl. Mean corpuscular haemoglobin range from 37.42 to 41.33pg. Mean corpuscular haemoglobin concentration value ranged from 32.13 to 33.13g/dl. Values for neutrophils and lymphocyte range from 2.60 to 4.21% and 95.33 to 98.00% respectively.

Table 4: Haematological indices of broiler chicken Fed Moringa, Neem or Bitter Leaf meal

Parameters	Control	Moringa	Bitter leaf	Neem Leaf	SEM	LOS
Packed Cell Volume (%)	30.08^b	32.51^a	32.82^a	33.27^a	1.10	*
Haemoglobin(g/dL)	8.60^b	10.25^a	10.03^a	10.34^a	0.90	*
White Blood Cell ($x10^{11}$/L)	2.15^b	2.27^a	2.25^a	2.29^a	0.08	*
Red Blood Cell ($x10^{12}$/L)	2.90^b	3.37^a	3.44^a	3.54^a	0.33	*
Mean Corpuscular Volume (fl)	122.77	121.13	123.83	121.57	1.11	NS
Mean Corpuscular Haemoglobin(pg)	37.42^c	40.27^b	40.47^b	41.33^a	0.35	*
Mean Corpuscular Haemoglobin Concentration (g/dL)	33.13	32.13	32.00	33.10	0.46	NS
Neutrophil (%)	2.60^b	3.94^a	4.12^a	4.21^a	0.33	*
Lymphocyte (%)	95.33^b	95.34^a	97.82^a	95.00^a	0.51	*

abcd= Means with different superscript along the same rows show significant difference at $p<0.05$, * = significantly different, SEM= Standard Error of the Mean. NS= Not significant, LOS= level of significant

Significant higher PCV values in the birds fed Moringa, Bitter leaf or neem leaf meal as compared to the control diet fed birds showed that Moringa, Bitter leaf or neem leaf meal did not compromised the health nor was the haematopoietic processes negatively affected but they were rather improved. Birds fed neem leaf had the highest significant value of 33.27%. When PCV

value is too high, it is an indication of a toxic factors which could have adverse effect on the formation of blood. However, values of 33.27% obtained for neem leaf fed birds was within value range of 27% to 35% reported by Kabeh and Jalingo (2007). Gbolade (2009) obtained higher PCV values of 34.50% to 37.96% when broilers were fed bitter leaf meal. Values of 30.81 obtained by Abou-Elezz et al. (2011) when ingredients of neem leaf diets were fed to finisher broilers, were in harmony with values obtained in this research. Gadzirayi *et al*. (2012) obtained PCV value range of 36.71% and 35.14% in broilers fed diets containing *Moringa oleifera* leaf-based diets. This implies that the dietary treatments offered were adequate for the production of blood cell. Haemoglobin also showed significant higher ($p<0.05$) values for the phytogenic supplemented broilers as compared to the control. However, no significant ($P>0.05$) difference was obtained within the supplemented groups. Haemoglobin values were in harmony with value range of 10.12 to 10.61g/dl reported by Ehebha and Eguaoje (2018) who reported 0.5% bitter leaf utilization in broiler chicken diet at 42 days. Ahiwe *et al*. (2014) however reported a value range of 10 to 14g/dl as normal haemoglobin value for healthy broiler chickens. Lower values of 6.51g/dl were reported by Martins (2013) for control on evaluating essential neem leaf fed to cockerels on their haematology parameter. Same trend was obtained for the white blood cell with significantly higher value obtained for the Moringa, bitter leaf and neem leaf fed broiler chickens. This shows indications of improved immune response due to the test ingredient. The value range of 2.15 to $2.99x10^{11}$/L corresponds to the 208.28 to 241.93 $x10^{9}$/L reported by Ahiwe *et al*. (2014) for healthy chickens. Values of 2.09 to $3.54x10^{12}$/L obtained for red Blood Cell showed superiority of the phytogenics additives over the control. Atangwho *et al*. (2010) reported that Vernolide and vernodalol from bitter leaf have been reported to aid in the build-up of red blood cells in broiler chickens. Values of red blood cell was within the 2.98 to $3.94x10^{12}$/l reported by Okolie *et al*. (2008). This shows that birds on the additive had more red blood cell and were less prone to anaemic conditions. With PCV, HB and RBC being within normal range, is an indication of the proper functioning of the bone marrow. Mean corpuscular haemoglobin (MCH) also showed significantly ($p>0.05$) higher value for the broilers fed diets with additives. However, birds fed neem showed the highest value of 41.43pg as compared to the rest treatment. Mean corpuscular

haemoglobin concentration result showed no significant (P>0.05) variation across treatments. Value range of 32.00g/dl to 33.10g/dl were obtained. These values were however in harmony with the 30.00g/dl to 35.00g/dl reported as normal range for broiler chickens (Mitruaka and Rawnsley, 1977). This indicates that there is no negative interaction between the energy and protein levels in the diet.

Neutrophils levels increased significantly (p<0.05) across treatments with the control having the least value of 2.60%. Values of 3.94, 4.12 and 4.21 were observed for Moringa, bitter leaf and neem leaf meal. Improved neutrophil level in the blood indicates the ability of the birds to recover from injuries and infection (Erasto *et al*., 2007). Similarly, higher lymphocytes values were obtained in the birds fed bitter leaf, neem leaf and moringa leaf meal. Lymphocytes are parts of the immune system that helps fight off diseases. The relatively high values for lymphocytes and neutrophils recorded in this study are not unusual and are within value range reported by Melesse *et al*. (2011), which are suggestive of adequate immunity of birds in all the treatments.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

Based on the observations from the results obtained in this research work, the following conclusions are drawn:

There is significant (p<0.05) improvement in the performance and haematological indices of the broiler chickens with the inclusion of *Veronia amygdalina, Moringa oleiferaand Azardiracta indica* leaf meal in the diets of the experimental broiler chickens at 0.5% inclusion levels. This might be as a result of the phytochemicals present in the additives as they tend to stimulate the productive performance of the broiler chickens

The Vermonia amygdalina showed significant (p<0.05) improved values in the performance characteristics. However, the *Azardiracta indica* leaf meal fed broiler chickens had significantly (p<0.05) higher haematological indices values in this experiment.

4.2 Recommendations

Based on the findings of this research, the following recommendations are made:

- Phytogenic feed additives like *Veronia amygdalina, Moringa oleiferaor Azardiracta indica* leaf mealbe incorporated in the diets of broiler chickens to aid the improvement of the growth performance and haematology of the chickens
- However, farmers'should beencouraged to utilize*Veronia amygdalina* or*Azardiracta indica*in raising broiler as they showed more superior growth performance and haematological indices of the chickens.

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