

Full Length Research Paper

Effect of orally administered bitter leaf (*Vernonia amygdalina*) extract on the growth performance and haematological parameters of broiler chicken

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The effect of administering graded concentration levels of *Vernonia amygdalina* (bitter leaf) extract to broiler birds for growth performance and health promoter potential (haematological parameters) was evaluated. The birds were randomly distributed into six treatments with three replicates per treatment, each replicate having 10 birds. Treatment 1 is the control treatment given only water, treatment 2 were given Neocyrl® antibiotics (1.5 g at manufactures prescription), treatments 3, 4, 5 and 6 were given bitter leaf extract at different graded concentrations (2.5, 5, 10, 15 g per liter of water, respectively). The highest weight gain (WG) was observed in the birds in treatment 5 compared to those in other treatments. The result showed that the haematological parameters was only significant ($p > 0.05$) at erythrocyte sedimentation rate (ESR), mean cell volume (MCV), mean cell haemoglobin (MCH) and mean cell haemoglobin concentration (MCHC). For growth performance, only final weight gain, daily weight gain, total feed intake and the feed conversion ratio was significantly ($p \leq 0.05$) different by the treatments.

Key words: *Vernonia amygdalina*, aqueous extract, bacteria isolates, health promoter potential, growth performance.

INTRODUCTION

Poultry keeping is one of the common and practical businesses in Nigeria today. It is a good source of livelihood for family subsistence because it requires less

capital investment compared to other domesticated animals (Manyong et al., 2005). Poultry health and good management practices are the core component of the

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operational dynamics of a developing and profitable production industry (Adene, 2004). However, the continuous rise in the cost of medicines (such as antibiotics) affect local broiler producers and also despite the observed improvement in broiler performance, the use of antibiotic growth promoters has been criticized due to its possible role in the occurrence of antimicrobial resistance in humans (Ratcliff, 2000). This has led a lot of poultry and plant experts to think of alternative sources to solve this problem. This new context caused an increase in the search for alternative growth promoters.

In recent years, interest has developed in many countries in the collection and extended use of medicinal plant extract for an alternative production purposes (Griggs and Jacob, 2005). Knowledge of medicinal plants has been the key for the survival of the ethnic groups who live in the interior. People who live far from towns and in forest still rely on traditional cures handed down to them through the generations that preceded them. Antibiotics have been used in poultry feed for improving growth performance, prevention of coccidiosis, some specific pathogenic microorganism and increasing some useful microorganism in intestinal micro flora over the years (Dibner and Buttin, 2002; Pangasa et al., 2007; Singla et al., 2007). In this study, the potentials of *Vernonia amygdalina* in improving the performance and health benefits of broiler was evaluated when administered in drinking water over a period of time .

MATERIALS AND METHODS

Experimental site

The experiment was carried out at the poultry experimental unit of the Teaching and Research Farm of the Federal University of Technology, Akure, Ondo State, Nigeria. The birds were acclimatized for 2 weeks and the experiment was conducted for 7 weeks. Also the laboratory analysis was carried out at the Department of Animal Production and Health in the same institution.

Experimental birds

A total number of 250 day-old broiler chicks of mixed sexes were purchased from a reputable hatchery in Ibadan, Oyo state out of which 180 were used for the experiment. Brooding of the birds was carried out at the farm using deep litter system.

Preparation of plant extract

The plant material used (*V. amygdalina*) was harvested from the Teaching and Research Farm of the Federal University of Technology, Akure previously identified by Dr Ogunika of Forestry and Wood Technology Department of the University. The leaf material was washed and drained before blending with industrial blender in distilled water. The method used was cold water extraction. The filtrate was obtained by sieving the blended leave

extract with muslin cloth folded into eight folds before it was then finally extracted in the extracting machine connected to Buckner funnel. The finest particle obtained was then kept in refrigerator before it was finally used at different inclusion levels on the birds at the experimental site (Osho and Lajide, 2012).

Experimental layout

The completely randomized design was used. After the one week pre-experimental (acclimatization) period, one hundred and eighty chicken broilers of marshal breed were grouped into six treatment and three replicate groups, with 10 chicks per group. Treatment 1 is the control given water only, T2 was given 1.5 g of Neocyrl® antibiotics, T3, T4, T5, and T6 were given 2.5, 5, 10 and 15 g of the extract per liter of water, respectively. Feed and water were offered *ad libitum* throughout the experimental period. The birds were acclimatized for one week and the experiment was conducted for 7 weeks. The live weight was recorded weekly, while feed and water intakes were recorded daily.

Data analysis

Data on bacteriological variable, haematological parameters, growth and performance characteristics were subjected to one-way analysis of variance (ANOVA) using SAS version 9.1 statistical package. Where significant differences were found, and the mean were separated using Duncan multiple range test.

RESULTS AND DISCUSSION

Feed intake

The total feed intake of birds in each treatment is shown in Table 1 in which Treatment 3 (5.71) and treatment 6 (5.71) have the highest total feed intake as compared to the birds in T1, T2, T4, and T5 but this was not significantly ($p > 0.05$) affected.

Weight gain

The effect of bitter leaf plant extract on the weight gain of broiler chicken shows that there was significant ($p < 0.05$) difference on the weight gain of the birds administered orally with bitter leaf plant extract at different inclusion levels of bitter leaf in T4 and T5 (5 and 10 g) compared with those in T1 (control) and T2 for the period of 7 weeks of the experiment (Table 1). However, birds given 10 g inclusion of bitter leaf plant extract (T5) have the highest weight gain (2.04 kg), followed by those in T4 (5 g inclusion) with (1.97 kg) weight gain. Birds in T6 given 15 g of the extract have (1.92 kg) compared with T1 (1.69 kg) and T2 (1.74 kg). This suggests that the inclusion level of treatment 5 could be the highest threshold of bitter leaf extract that could enhance weight gain in broilers. Contrary to this, highest feed conversion ratio was found in treatment 1.

Table 1. Growth and performance of experimental birds orally administered graded concentration of *Vernonia amygdalina* extract.

Parameter	Treatments					
	T1	T2	T3	T4	T5	T6
Initial wt	0.25±0.04	0.23±0.04	0.24±0.04	0.23±0.06	0.23±0.06	0.22±0.04
Final wt	1.95±0.30 ^c	1.96±0.31 ^c	2.04±0.36 ^{bc}	2.20±0.34 ^{ab}	2.28±0.41 ^a	2.14±0.27 ^{abc}
WG	1.69±0.32 ^d	1.74±0.30 ^{cd}	1.80±0.38 ^{bcd}	1.97±0.33 ^{ab}	2.04±0.41 ^a	1.92±0.28 ^{abc}
DWG	0.03±0.01 ^d	0.35±0.01 ^{cd}	0.36±0.01 ^{bcd}	0.04±0.01 ^{ab}	0.04±0.01 ^a	0.03±0.01 ^{abc}
Total FI	5.68±0.26	5.70±0.25	5.71±0.28	5.69±0.25	5.68±0.25	5.71±0.24
DF intake	0.12±0.01	0.12±0.01	0.12±0.01	0.12±0.01	0.12±0.01	0.12±0.00
FCR	3.46±0.69 ^a	3.41±0.86 ^{ab}	3.34±0.93 ^{abc}	2.96±0.52 ^{cd}	2.89±0.63 ^d	3.04±0.48 ^{bcd}

T1 = Water only, T2 = 1.5 g/L of antibiotics, T3 = 2.5 g/L of bitter leaf extract, T4 = 5 g/L of bitter leaf extract, T5 = 10 g/L of bitter leaf extract, T6 = 15 g/L of bitter leaf extract. Weights are measured in kilogram body weight (kg). Means with the same superscript (a, b, c, d) are not significantly different (mean ± standard error). DWG = daily weight gain in kg; FCR = feed conversion ratio; TFI = total feed intake; DFI = daily feed intake and WG = weight gain.

Table 2. Water intake (Litre) of broiler chicken at varying level of treatment.

Parameter	T1	T2	T3	T4	T5	T6
T water intake	117.32±2.66	115.20±2.22	110.15±3.46	116.98±2.74	113.41±2.46	111.98±3.23
D water intake	2.39±0.05	2.35±0.05	2.25±0.07	2.39±0.06	2.31±0.05	2.29±0.07

T1= Water only; T2= 1.5 g/L of antibiotics; T3 = 2.5 g/L of bitter leaf extract; T4 = 5 g/L of bitter leaf extract; T5 = 10 g/L of bitter leaf extract and T6 = 15 g/L of bitter leaf extract.

Feed conversion ratio (FCR)

Feed conversion ratio was calculated as feed intake consumed per unit of gain. The feed conversion ratio of broilers given water only (T1) and T2 given 1.5 g antibiotics was not significantly ($p > 0.05$) different but there was significant ($p < 0.05$) difference between T3 and T5.

Water intake

Table 2 shows the total water intake and daily water intake of the birds in each treatment. The result shows that there was no significant ($p > 0.05$) difference in the water intake of the experimental birds. However, treatment 1 (which was given water only) had the highest water intake (117.32) as compared with T2 (115.20), T3 (110.15), T4 (116.98) and T5 (113.41) while T6 had the lowest water intake (111.98) and this may be due to the high concentration of inclusion of bitter leaf plant extract (15 g inclusion level).

Haematological variable

The red blood cell (RBC) and packed cell volume (PCV)

were found to differ in birds administered orally with *V. amygdalina* and those that were not administered (Table 3). Of the entire haematological variables measured, only ESR (erythrocyte sedimentation rate), MCV (mean cell volume), MCHC (mean cell haemoglobin concentration) and MCH (mean cell haemoglobin) were significantly ($p < 0.05$) influenced by the experiment. The total ESR of birds in T3 (4.17 ± 1.19 mm/h) was significantly ($p < 0.05$) different from those in T4 (1.67 ± 0.21 mm/h) but identical with ($p > 0.05$) to those of T1, T2, T5 and T6. The range goes between 1.67 to 4.17 mm/h. The birds in the treatments were significantly ($p < 0.05$) different for the MCHC value. Birds in T4 (5 g bitter leaf extract level) had the highest MCHC (33.30%) and this positively compared with those in T1 (33.22%), T5 with 10 g inclusion of the extract (33.24%), T6 with 15 g/L inclusion of extract (33.28%), treatment 2 with 1.5 g of antibiotic (33.18%) and also treatment 3 with 2.5 g/L of the extract had the least MCHC value (33.17%) and this was not significantly ($p > 0.05$) lower than those of treatment 1, treatment 5 and treatment 6 but significantly ($p < 0.05$) lower than treatment 5. Also for MCV, there was significant ($p < 0.05$) difference between T1, T2, T3 compared to those in T4, T5 and T6. MCH value of birds in T4 is significantly ($p < 0.05$) different from T6 as compared to those in T1, T2, T3 and T5 which are not significant ($p > 0.05$). All these parameters fell within the range of the normal haematological

Table 3. Haematology profile of broiler chicken orally administered graded concentration of *Vernonia amygdalina* extract.

Variables	Treatments					
	T1	T2	T3	T4	T5	T6
ESR(mm/h)	2.00±0.37 ^{ab}	3.17±0.48 ^{ab}	4.17±1.19 ^a	1.67±0.21 ^b	2.33±0.33 ^{ab}	3.67±0.92 ^{ab}
PCV (%)	30.00±0.73	28.33±0.71	27.83±2.20	31.33±0.71	29.83±0.65	28.17±1.82
RBC×10 ⁶ /mm ³	2.08±0.07	1.88±0.11	1.92±0.25	2.31±0.09	2.15±0.12	1.85±0.21
Hb (g/100 m)	9.97±0.24	9.40±0.24	9.23±0.73	10.43±0.23	9.92±0.22	9.37±0.59
LYM (%)	59.67±1.02	60.00±1.98	59.17±1.33	60.17±1.51	58.00±1.29	58.67±1.45
NEU (%)	24.33±0.84	24.00±0.97	25.67±0.99	24.17±0.79	24.83±0.48	24.50±0.76
MONO (%)	12.83±1.14	13.17±1.45	12.17±0.87	12.50±0.99	14.17±1.14	13.50±1.28
BAS (%)	2.17±0.17	2.00±0.00	2.00±0.00	2.17±0.17	2.17±0.17	2.33±0.21
EOS (%)	1.00±0.00	0.83±0.17	1.00±0.00	1.00±0.00	0.83±0.17	1.00±0.00
MCV (µm ³)	144.40±1.88 ^a	152.44±4.94 ^a	150.32±8.45 ^a	136.2±3.4 ^b	140.1±5.3 ^b	156.1±6.1 ^b
MCHC (%)	33.22±0.04 ^{ab}	33.18±0.04 ^b	33.18±0.04 ^b	33.30±0.02 ^a	33.24±0.03 ^{ab}	33.27±0.04 ^{ab}
MCH (pg)	47.97±0.64 ^{ab}	50.57±1.64 ^{ab}	49.86±2.79 ^{ab}	45.37±1.15 ^b	46.58±1.77 ^{ab}	51.94±2.29 ^a

Means with similar superscripts on the same column are not significantly ($p > 0.05$) \pm mean standard error. PCV = packed cell volume; LEUM = leucocyte; BAS = basophil; Neu = neutrophil; EOS = Eosinophil; Hb = haemoglobin; MONO = monocytes; MCHC = mean Cell haemoglobin concentration; MCH = mean cell haemoglobin; MCV = mean cell volume; ESR = erythrocyte sedimentation rate.

variables for chicken MCH which was slightly higher for birds in the treatment 2, 3 and 6. Basophil was slightly lower for birds in T2 and T3 and the Eosinophil values were generally lower across the six treatments as shown in Table 3.

DISCUSSION

Blood represent a means of assessing clinical and nutritional health status of animals in feeding trials and the haematological variables most commonly in nutritional studies include packed cell volume (PCV), red blood cell (RBC), Hb, MCHC, MCV and the clotting time (Aletor and Egberongbe, 1992). The result of this study shows that the ability of the extract to alter the distribution and occurrence of lymphocyte, neutrophil, eosinophils, basophil and monocytes suggest the potentiality of the extract acting as an immunostimulant. However, neutrophil count was lower and lymphocyte higher in the birds that were treated with the extract. Neutrophil is the most abundant circulating granulocytes and their granules contain numerous molecules and when a chemotactic factor is produced as a result of infection or injury, in the extracellular site, these cells enter the tissues (Weir and Stewart, 1999).

The haemoglobin level and PCV were higher in treatment 5 with 10 g of the extract than the rest treatments. Acute inflammation from most pathogenic microorganisms results in haemolysis which is manifested in lower haemoglobin level and PCV (Kumarnsit et al., 2006). The higher values of these haematological indices in the treatment administered the extract can be due to

their inability to cause haemolysis resulting from the anti-inflammatory potentials inherent in *Vernonia amygdalina*. Some haematological variables measured (ESR, MCV, MCHC, MCH) were significantly ($p < 0.05$) influenced in the experiment. Cole (1986) reported that caged birds have a PCV of 35 to 55% and a PCV of less than 35% indicates anaemia, while one greater than 55% suggests dehydration. However, Ross et al. (1978) gave a range of 25 to 45% as been normal. The PCV values obtained were within this range, this signifies that there were no symptoms of physiological anaemia in the experimental birds. However, there were low RBC values obtained in treatments 2 and 6.

The significance differences in MCHC, MCH and MCV values suggested that there were differences in corpuscular sizes even when the blood collected had similar haemoglobin content. The relevance of MCHC, MCH and MCV measurement lies in their use in the diagnosis of anaemia and an index of the capacity of bone marrow to produce RBC (Aletor and Egberongbe, 1992). With regards to the blood physical properties, the erythrocyte sedimentation rate (ESR) as well as the haematological indices in this present study fell within the normal range reported by Ross et al. (1978) and Mitruka and Rawnsley (1977). It is believed that the frictional resistance of the surrounding plasma, which holds the cells in suspension and the gravitational pull on the erythrocyte, mostly determines the ESR. Wide ranges of normal haematological values were also reported by other authors (Bell and Freeman, 1971; Mitruka and Rawnsley, 1977; Oyewale, 1985; Mhatre and Joshi, 1993; Ogbe et al., 2003; lheukwumere et al., 2006). Fluctuations in haematological values of avian blood are

normal phenomenon and in most instances the variations in haematological values may depend on the physiological state of birds (Islam et al., 2004).

The growth performance shows that the final weight (FW), total weight gain (TWG), and feed conversion ratio (FCR) of the birds were significantly ($p < 0.05$) different. Though the experimental birds were selected at random, they have almost the same live weight at the beginning of the experiment. Treatment 5 had the highest weight gain (2.04) at the end of the experiment. This shows an optimum level of extract administration to which performance is also good and this could be recommended for farmers. The findings of the research might present balanced alternative for the use of antimicrobial.

This also creates an environment of intestinal tract balance and which results to better utilization of feed and eventually weight gain. The better FCR in T5 (2.89) were due to the effect of medicinal extract that has been reported to increase production of digestive enzymes and improved utilization of digestive products through enhanced liver function (Hernandez et al., 2004). The efficiency of feed conversion ratio ranged between (2.89 and 3.46) which is higher than the value (0.13 and 0.2) observed by Bonsi et al. (1995) but far less than the value (19.8) reported by Rankis (1996).

Powdered *V. amygdalina* leaf was able to increase the FCR of cockerels without affecting their haematological profile (Olobatoke and Oloniruha, 2009). The lower the FCR, the higher it is for the birds to convert the feed to muscle which treatment 5 was able to do. However, there was no significant difference in the water intake of the treatments but T1 and T4 have the highest water intake (117.32 and 116.98 ml). These results could be correlated with Durrani et al. (2007) who reported that medicinal herb extract, given in drinking water had no significant effect ($p > 0.050$) on the water intake of the broiler chicks.

Conclusion

The result obtained in this study shows that bitter leaves extract could be a source of medicinal application in water for poultry birds. It improved body maintenance and it was tolerable, acceptable and favourable to the poultry. It could also be concluded therefore that bitter leaf improves the water intake. Relatively lower counts of bacteria were obtained in nearly all the specimens examined, which imply that the bacteria growth might not likely be highly attained beyond this level.

Conflict of Interest

The author(s) have not declared any conflict of interests.

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