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# Impact of Aqueous Leaf Extract of Coffee Weed (*Senna Occidentalis*) on The Blood Profile of Broiler Chickens

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*The feeding trial was conducted for eight weeks to test the effect of aqueous leaf extract of coffee weed (Senna occidentalis) on the haematology and serum chemistry of one hundred and twenty day-old Aborican broiler chickens. Each treatment group contained three replications with eight birds per replicate to make a total of twenty four chicks per treatment group. The birds were assigned to five dosages (0, 25, 50, 75 and 100ml) of coffee weed leaf aqueous extract (CWLAE) designated as treatments 1 to 5 (T1, T2, T3, T4 and T5). The haematological traits showed that packed cell volume (PCV), haemoglobin (Hb), red blood cell (RBC), white blood cell (WBC), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and lymphocytes were affected ($p<0.05$) by the levels of coffee weed leaf aqueous extracts (CWLAE), however, mean corpuscular haemoglobin concentration (MCHC), red disc width (RDW), platelets and neutrophils were ($p>0.05$) similar. Data on the serum biochemical indices of broiler chickens revealed that total protein, albumin and globulin values were significantly ($p<0.05$) affected by the treatments but creatinine, urea, cholesterol, SGOT and SGPT values were not affected by the treatments ($p>0.05$). It could therefore be inferred that the inclusion of coffee weed leaf aqueous extract up to 100ml in drinking water did not have any adverse effect on the blood profile of broiler chickens.*

**Key words:** Drinking water, haematology, Nigeria, serum chemistry, poultry, probiotics

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## Introduction

Feed is a major component of the total cost of production of meat and egg type chickens in the poultry industry, thus with improved stock, broiler chickens could attain a weight of 2.3kg within five to six weeks (Oluyemi and Roberts, 2000). However, this production capacity is subject to availability of good quality feed and disease control but with the current advent of exclusion of antibiotic growth promoters in poultry production in Europe and America, the issue of controlling enteric infections caused by pathogenic bacteria through the use of antibiotics has become a challenge (Kehinde *et al.,* 2011). Mortality caused by infections is one of the major problem in the poultry industry because such infections contribute to reduced growth rates and consequent economic losses (Afolayan *et al.,* 2014). In animal production, antibiotics are the main tools utilized to prevent or treat infections and may be added to feeds as growth promoters to accelerate the growth of healthy animals. Unfortunately the long term and extensive use of antibiotics for veterinary purposes had eventually resulted to the selection for the survival of resistant bacteria species or strains (Aarestrup, 1999). The genes encoding for this resistance could be transferred to other formerly susceptible bacteria thereby posing a threat to both livestock and human health (Montagne *et al.,* 2003). Against this backdrop, poultry nutritionists have been challenged to shift attention to alternatives to antibiotics such as medicinal herbs as replacements for antibiotic growth promoters (AGP) (Montagne *et al.,* 2003).

Herbs or products including plant extracts, essential oils or the main components of the essential oil are among the alternative growth promoters that are already being used (Alabi *et al.,* 2008). Herbs, spices and various plant extracts have appetizing, digestive and antimicrobial properties (Sugiharto, 2016). Natural medicinal products originating from herbs and spices have also been used as feed additives for farm animals (Guo, 2003). Some of these herbs and spices indigenous to Africa which have been used to enhance nutrient utilization and performance of poultry birds include: siam weed (Chromolena odorata), syndrella weed (Syndrella modifera), scent leaf (Occinum grattisimum), bitter leaf (Veronia amygdalina), neem (Azadirachta indica), moringa leaf (Moringa oleifera) coffee weed (Senna occidentalis) and aloe vera (Aloe barbedensis) (Windisch *et al.,* 2008; Odoemelan *et al.,* 2013). However, coffee seed (Senna occidentalis) is presently being focused on globally as another promising leaf meal in livestock feeding because it

has been adjudged to be a good vegetable-based protein source with a rich source of essential plant amino acids, vitamins, minerals and antioxidants (Sreejith *et al.,* 2010).

Senna occidentalis has been used as a natural medicinal plant in the rain forest and other tropical areas for decades (Babitha, 2011) with its roots, leaves, flowers and seeds employed in herbal medicine around the world (Sambasivam *et al.,* 2016). The seeds are brewed into coffee like beverage for asthma and a flower infusion is used to treat bronchitis (Babitha, 2011). They are used for menstrual problems, tuberculosis, anaemia, liver complaints and as a tonic for general weakness and illness (Arya, 2011). The leaves are used for the treatment of fever, urinary tract disorder, gonorrhoea and edema (Yadav, 2010). Senna occidentalis leaf extract is used to cure eye inflammations, constipation, eczema and veneral diseases. The extracts have been found to contain significant antibacterial, diuretic and antifungal properties (Sreejith *et al.,* 2010). It has been suggested that Senna occidentalis has as the potential for the treatment of allergic and inflammatory diseases (Sreejith *et al.,* 2010) and that the various parts of the plant are used in livestock production. The nutrient composition showed that the seed has crude protein in the range of 18.64 to 29.54% (Ingweye *et al.,* 2010) which indicated that the plant could be a potential protein source for livestock feeding and medicinal purposes. The proximate composition of aqueous Senna occidentalis extracts showed 10% moisture, total ash of 7.4 to 8.0%, 5.3 to 5.9% acid insoluble ash, alcohol and water extractive values of 7.7% and 15.1% respectively (Daniyan *et al.,* 2011). Crude protein of 23%, crude fibre 20.8%, lipid 14.9% and carbohydrates 48.1% were reported by Al-Snafi (2015). Omoikhoje *et al*. (2018a) recently reported moisture content, crude protein, crude fibre, crude fat, ash and nitrogen free extract values of 9.35, 21.88, 19.72, 16.88, 9.70 and 22.4% respectively of aqueous leaf extract of Senna occidentalis. The phytochemical analyses of Senna occidentalis revealed the presence of alkaloids, anthocyanosides, phenolics, proteins, chlorobatamins, steroids, tannins, resins, basalms, amino acids, carbohydrates, sugars, and cardiac glycosides, flavonols and flavols (Veerachi and Bopaiah, 2012; Omoikhoje *et al.,* 2018a). In the same vein, Omoikhoje *et al.* (2018b) opined that Senna occidentalis aqueous leaf extract could be used as probiotic additive at 50mls/liter of water for improved performance, carcass traits, better cost and returns of broiler chickens.

The present study was aimed at evaluating the effect of coffee weed (Senna occidentalis) leaf aqueous extract on the haematological and serum biochemical indices of broiler chickens.

## MATERIALS AND METHODS

### Experimental location and climate

The experiment was carried out at the Poultry Unit of the Teaching and Research farm, Ambrose Alli University, Ekpoma, Edo State of Nigeria for a period of eight (8) weeks (between the months of June and August, 2018). The farm lies between latitude 6.440 N and longitude 6.800 E in Esan West Local Government area, Ekpoma, Edo State, Nigeria. Ekpoma is within the South – South geo-political zone of Nigeria and has a prevailing tropical climate with a mean rainfall of about 1556mm. The mean ambient temperature ranges from 26oC in December to 34oC in February, relative humidity ranges from 61% in January to 92% in August with early morning average of about 82%. The vegetation represents an interface between the tropical rainforest and derived savannah.

### Sources of feed and fresh coffee leaves

Commercial broiler starter and finisher diets were purchased from a commercial feed dealer in Ekpoma, Esan West Local Government Area of Edo State, Nigeria. Fresh coffee weed (Senna occidentalis) leaves were purchased from Ekpoma main market in Esan West Local Government Area of Edo State, Nigeria.

Processing of coffee leaf extract (experimental ingredient)

The fresh leaves were thoroughly rinsed, dried and sparsely spread on jute mat at room temperature of between 25 to 26oC for 6 to 7days until they became crispy. The leaves were turned regularly to avoid uneven drying and decay as well as ensuring that the greenish colour of the leaf was maintained. The dried crispy leaves were hammer milled through a 2mm sieve and stored in airtight containers to avoid the absorption of moisture till they were used for laboratory analyses and preparation of the aqueous extract. A measured quantity (50g) of the ground leaves was infused in 1litre of boiled hot water overnight (12h). Thereafter, the solution was filtered in the morning and a measured quantity of the filtrate according to the experimental treatment was

added to 1litre of drinking water and served to the birds ad libitum.

**Experimental feeding and treatments**

The birds were allowed free access to commercial starter and finisher diets (Table 1). In addition, five (5) treatments (T1, T2, T3, T4 and T5) were prepared to contain 0, 25, 50, 75 and 100ml of coffee weed leaf aqueous extract (CWLAE) per litre of drinking water and 2.5g of Centre tidox (Doxycycline and Tylosin) was served to the birds on T1 at intervals of two weeks as positive control.

**Experimental birds, design and management**

A total of 120 broiler chicks were used for the experiment. Twenty four (24) chicks were randomly selected and allocated to each of the five (5) treatment groups (T1, T2, T3, T4 and T5) in a completely randomized design (CRD). Each treatment group contained three (3) replicates with eight (8) birds per replicate. The chicks were brooded for four (4) weeks and during this period; they were fed the commercial starter diet without the experimental treatments for one week acclimatization period. Thereafter, the coffee weed leaf aqueous extract (CWLAE) was added to their drinking water for three (3) weeks at the starter phase. At the finisher phase, the chicks were supplied the commercial finisher diet and the treatments (T1, T2, T3, T4 and T5). The birds were allowed free access to the commercial diets and treatments throughout the duration of the study. All routine management practices were carried out including vaccinations.

Table 1: Nutrient composition of the commercial starter and finisher diets (according to the manufacturers leaflet attached to the bag)

| Nutrients (%) | Starter | Finisher |
|---|---|---|
| Crude protein | 21.00 | 18.00 |
| Fat/oil | 6.00 | 6.00 |
| Crude fibre | 5.00 | 6.00 |
| Calcium | 1.00 | 1.00 |
| Available phosphorus | 0.45 | 0.40 |
| Lysine | 1.00 | 0.85 |
| Methionine | 0.60 | 0.30 |
| Salt | 0.30 | 0.30 |
| Metabolizable energy (Kcal/Kg) | 2900 | 2900 |

**Haematological and serum biochemical studies**

At the end of the finisher phase, the birds were fasted overnight and three chicks were randomly selected from each treatment group at the early hours of the morning. Using syringes and needles, 5ml of blood samples were collected through the wing veins from each of the selected chicks per treatment group into sterilized tubes containing ethylene diamine tetra-acetic acid (EDTA) labeled bottles as anticoagulants for haematological studies. While another set of 5ml of blood samples were collected from the same birds into heparinised tubes for serum chemistry determination. Packed cell volume (PCV), red blood cell (RBC), white blood cell (WBC) and haemoglobin (Hb) were determined using improved Neubar's haemaetometer after dilution and cyanomethaemoglobin method as described by Dacie and Lewis (1991). Mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were determined using the method of Hyduke (1975).

Blood samples for serum chemistry determination were allowed to coagulate and centrifuged at 3000rpm for 10minutes to separate the serum. Thereafter, the separated sera were used for the evaluation of

the serum total protein, albumin, creatinine, urea and cholesterol using the method of Hyduke (1975). Serum glutamate oxaloacetate transaminase (SGOT) and serum glutamate pyruvate transaminase (SGPT) values were determined using method described by Jain (1986). Globulin value was estimated by the subtraction of albumin value from serum total protein value (Dacie and Lewis, 1991). Cholesterol levels of the birds were examined by dissolving the enzyme reagent to 100ml in the cholesterol buffer solution, thereafter, the mixture was placed in a water bath at 37 oC for five minutes. Blank solution, standard solution and the sample solution were placed in a LAMBDA 465 (UV/V Spectrophotometer) and data were collected over full wave length range of 190-1100nm. The data were processed using the UV laboratory software and the cholesterol level was calculated using the formula below:

$$\text{Cholesterol level (m g/dl)} = \frac{\text{Absorbance of sample}}{\text{Absorbance of standard}} \times \frac{300}{1}$$

Blood samples were collected in the Teaching and Research Farm, kept in cool container with ice cubes and were immediately conveyed to the Laboratory for analyses.

**Statistical analysis**

Data generated were subjected to a one-way analysis of variance (ANOVA) and treatment means that significantly differed were compared using the Duncan's Multiple Range Test as outlined by Steel and Torrie (1990) using the SPSS (2014) Version 2.0 model.

## RESULTS AND DISCUSSION

The haematological changes in the treatment groups were shown by the higher ($P<0.05$) packed cell volume (PCV), haemoglobin (Hb) and red blood cells (RBC) in chicks placed on 75mls of CWLAE compared to other treatment groups (Table 2). This connotes an improvement in the oxygen carrying capacity of the cells which may be translated to better availability of nutrients to the birds thereby affecting their well-being. In addition, it may also suggest that the *Senna occidentalis* aqueous extract does not contain

any constituent that has a depressant effect on the haemopoietic organs. The results of the study agrees with the report of Oleforuh-Okoleh *et al*. (2015) who observed significant variation in the values of PCV, Hb and RBC of broiler chickens fed graded levels of ginger and garlic extract and fell within the normal reference ranges of broiler chickens (Mitruka and Rawnsley, 1977). The highest ($P<0.05$) level of white blood cell (WBC) recorded in the control compared to those on the treatment groups points to the fact that *S. occidentalis* leaves may contain several phytochemicals which could enhanced the quality and the quantity of the WBC which perhaps made the birds less susceptibility to infections. This corroborated the assertion that broiler chickens maintained on different levels of baobab leaf extract had higher WBC compared to the control (Oloruntola *et al.,* 2018). The values of mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC) were ($P<0.05$) higher in birds placed on 100mls CWLAE but all the values fell within the normal physiological ranges for broiler chickens (Mitruka and Rawnsley, 1977) suggestive of the absence of hypochromasia, (Olafadehan, 2011). There was also no macrocytic (regenerative) or microcytic (non regenerative) anaemia since the MCV values were within the normal ranges (Jain, 1986). Similarities ($p>0.05$) in the mean corpuscular haemoglobin concentration, red blood cells distribution width, platelets, neutrophils and lymphocytes values was indicative of the fact that both the nutrient and phytochemical profiles of the various dosages of coffee weed leaf aqueous extract adequately supported the performance (blood quality) of the broiler chickens. This lends support from the report of Jain (1986) that nutritional deficiencies particularly that of protein reduce most haematological and serum biochemical indices of birds. However, these findings supported the report of Egbeyale *et al.* (2018) who opined that air-dried neem leaf extract could be used as an alternative to antibiotics without any adverse effect on the blood profile of broiler chickens. Generally, haematological parameters recorded in this study fell within the physiological normal ranges recommended by Mitruka and Rawnsley (1977), Maxwell *et al.* (1990).

**Table 2: Haematological indices of broiler chickens as influenced by the treatments**

| | Dosages of CWLAE (mls) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 25 | 50 | 75 | 100 | | |
| | Treatments | | | | | | |
| Indices | 1 | 2 | 3 | 4 | 5 | SEM± | Normal reference ranges |
| PCV (%) | 35.43$^{c}$ | 40.60$^{a}$ | 34.63$^{c}$ | 42.30$^{a}$ | 37.73$^{b}$ | 0.73 | 32.00-45.00 |
| Hb (g/dl) | 11.73$^{c}$ | 13.38$^{a}$ | 11.43$^{c}$ | 13.55$^{d}$ | 12.57$^{b}$ | 0.22 | 8.00-3.00 |
| RBC (x $10^{9}$/l) | 2.79 | 3.20 | 2.89 | 3.42 | 2.82 | 0.66 | 2.50-4.50 |
| WBC (x$10^{3}$/$mm^{3}$) | 114.60$^{a}$ | 108.93$^{d}$ | 111.33$^{b}$ | 109.40$^{c}$ | 111.35$^{b}$ | 0.53 | 99.00-193.00 |
| MCV (fl) | 124.45$^{b}$ | 123.40$^{b}$ | 122.05$^{b}$ | 124.40$^{b}$ | 128.05$^{a}$ | 0.63 | 90.00-140.00 |
| MCH (pg) | 41.15$^{b}$ | 40.65$^{b}$ | 41.20$^{b}$ | 40.35$^{b}$ | 42.40$^{a}$ | 0.22 | 23.00-47.00 |
| MCHC (g/dl) | 33.25$^{a}$ | 32.95$^{b}$ | 33.05$^{a}$ | 32.55$^{b}$ | 33.05$^{a}$ | 0.13 | 30.20-36.20 |
| RDW | 9.50 | 9.35 | 9.65 | 9.37 | 9.25 | 0.08 | 4.45-14.21 |
| MxD (%) | 20.45 | 20.85 | 20.40 | 21.10 | 20.65 | 0.28 | 16.00-25.75 |
| Platelet (x$10^{3}$/$mm^{3}$) | 39.00 | 36.17 | 37.00 | 37.50 | 39.00 | 2.29 | 25.15-45.65 |
| Neutrophil (%) | 8.80 | 8.95 | 9.10 | 8.80 | 8.87 | 0.31 | 6.10-16.80 |
| Lymphocyte (%) | 71.65$^{a}$ | 69.30$^{b}$ | 70.25$^{ab}$ | 70.40$^{ab}$ | 70.95$^{ab}$ | 0.28 | 22.00-55.00 |

abcde: Means in the same row with varying super script differ ed significantly ($p < 0.05$)
SEM±: standard error of means, CWLAE: Coffee weed leaf aqueous extract.

The use of chemical indices as indicator to conditions that cannot be readily noticed by performance indices cannot be over emphasized. Serum protein, albumin and globulin syntheses are related to the availability of protein and micro-nutrients (Hofferberg and Block, 1996).

The variations ($p<0.05$) in the serum protein, globulin and albumin (Table 3) with the highest ($p<0.05$) values recorded among chicks that had 50mls CWLAE may be due to the supplementary role of the coffee weed leaf aqueous extract to the diet because the plant had

been adjudged to be a renowned plant protein source fortified with amino acids, vitamins and minerals (Sambasivam *et al*., 2016). The values of serum total protein, globulin and albumin were within the recommended normal reference ranges for broiler chickens (Mitruka and Rawnsley, 1977). Besides, the similarities ($p>0.05$) in the creatinine values of the broiler chickens maintained on the coffee weed leaf aqueous extract further affirmed that the various dosages of the extract did not cause any tissue damage. Eggum (1970) reported that creatinine is an indirect measure of protein utilization in poultry birds, the non-significant differences observed in the creatinine values of broiler finishers indicated efficient protein utilization which suggested that coffee weed leaf aqueous extract supplemented the diet. Serum urea is known to be a function of the protein quality ingested by the animal, energy deficiency and disease condition which impair protein utilization (Ogunwole *et al*., 2017). When a diet is deficient in essential amino acids, the amino acid present may be deaminated resulting to an increase in urea excretion (Olomu, 2011). In the present study the various dosages of CWLAE had comparable urea values to that of the control. The least cholesterol value was recorded in broiler chickens on 50mls of coffee weed leaf aqueous extract, although the values were the same ($p>0.05$) across the treatments. This finding agrees with the reports of Bhandari *et al.* (1998) and Akhani *et al*. (2004) who reported that ginger supplementation significantly decreased serum cholesterol of broiler chickens. Similarly, Mansoub (2011) reported reductions in total cholesterol values when broiler chicken diets were supplemented with bitter leaf extract. The results of the present study further agreed with the findings of Stanacev *et al*. (2011) who reported that scent leaf extract manifested hypocholesterolemic effects on chickens through inhibition of the most important enzymes that participate in the synthesis of cholesterol and lipids.

**Table 3: Serum biochemical indices of broiler chickens as influenced by the treatments**

| | Dosages of CWLAE (mls) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 25 | 50 | 75 | 100 | | |
| | Treatments | | | | | | Normal reference ranges |
| Indices | 1 | 2 | 3 | 4 | 5 | SEM± | |
| Total protein (g/dl) | 3.25$^{c}$ | 4.25$^{b}$ | 6.10$^{a}$ | 4.25$^{b}$ | 3.30$^{c}$ | 0.28 | 2.50-5.50 |
| Globulin (g/dl) | 1.65$^{c}$ | 2.25$^{b}$ | 3.60$^{a}$ | 2.30$^{b}$ | 1.65$^{c}$ | 0.19 | 1.00-4.50 |
| Albumin (g/dl) | 1.60$^{b}$ | 2.00$^{ab}$ | 2.50$^{a}$ | 1.95$^{ab}$ | 1.65$^{b}$ | 0.11 | 1.10-4.00 |
| Creatinine (g /dl) | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.01 | 0.20-0.50 |
| Urea (g/dl) | 8.00 | 6.00 | 5.50 | 6.50 | 6.00 | 0.40 | 6.50-8.00 |
| Cholesterol (mg/dl) | 160.00 | 159.00 | 155.00 | 151.00 | 151.67 | 3.07 | 74.50-81.50 |
| SGOT (mmol/l) | 130.67 | 133.00 | 135.00 | 137.00 | 135.00 | 1.37 | |
| SGPT (mmol /l) | 13.00$^{b}$ | 11.67$^{c}$ | 12.00$^{c}$ | 16.00$^{a}$ | 11.00$^{c}$ | 0.76 | |

abc: Means in the same row with varying super script differed significantly (P<0.05)
SEM±: standard error of means, CWLAE: Coffee weed leaf aqueous extract.

Recently, Djellout *et al.* (2018) reported a reduction in the cholesterol value of broiler chickens supplemented with 0.03% essential oil of Origanum onites. The non-significant differences in most of the blood serum biochemical indices reported in this study is in consonance with those of Yusuf *et al.* (2008) and Oladunjoye *et al.* (2014) who observed non-significant variation in the serum metabolites of albino rats, guinea fowls and rabbits fed baobab seed based diets. This further suggests the nutritional adequacy and safety of the test material. The similarities (p>0.05) in the values of serum glutamate oxaloacetate transaminase (SGOT) and serum glutamate pyruvate transaminase (SGPT) points to the fact that the different dosages of coffee weed leaf aqueous extract did not initiate any form of liver damage in the birds because abnormal increases in the levels of these enzymes in the blood connotes liver damage or degeneration. Further to this, the comparable values of SGPT, SGOT, urea and creatinine in broiler chickens raised on the CWLAE treatments with that of the control group showed that there was no hepatorenal damage caused by enterohepatonephrotoxicity. Therefore, the inclusion of coffee

weed leaf aqueous extract up to 100mls/liter of water posed no threat to the health status of broiler chickens.

## CONCLUSION

It could therefore be inferred that coffee weed leaf aqueous extract could be offered to broiler chickens up to 100mls/liter of water as probiotic additive without any deleterious effect on their blood profile.

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