Carcass traits and internal organs of broiler chickens as influenced by coffee weed (*Senna occidentalis*) leaf ethanolic extract

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Abstract

Carcass traits and internal organs of one hundred and twenty, one day-old broiler chicks maintained on different dosages of coffee weed leaf ethanolic extract for eight weeks were studied. Five dosages (0, 25, 50, 75 and 100mL) of coffee weed leaf ethanolic extract (CWLEE) per litre of drinking water (T_1 , T_2 , T_3 , T_4 and T_5) were used. The birds were allocated to the various treatment groups in a completely randomized design (CRD) with each treatment replicated three times (8 birds per replicate). Data on carcass traits revealed that live weight (2.50kg/bird), defeathered (2.30kg/bird) and eviscerated (2.00kg/bird) weights as well as dressing percentage (81.69%) were significantly ($P < 0.05$) higher among birds on 50mL of CWLEE compared to those on other treatment groups. Similarly, the relative weights of drumstick (16.60%) and thigh (22.28%) were also significantly ($P < 0.05$) better in broiler chickens administered 50mL CWLEE. Relative organ weights of broiler showed that weight of heart, lungs, gizzard, bursa, spleen and kidney were significantly ($P < 0.05$) influenced by the treatments. It is therefore inferred that birds administered 50mL CWLEE gave better carcass quality and functioning of the vital organs and therefore can be recommended for broiler chickens.

Keywords: Broilers, carcass, coffee weed, extract, organs

Introduction

In order to achieve maximum health, better growth performance and high carcass weight in poultry birds, nutritionally balanced diet with good vaccinations and treatments are imminent. However, the use of antimicrobials had been adjudged to be one of the most successful chemotherapies against disease causing organisms (Guyue *et al.*, 2014) and they have made significant contributions to the prevention, control and treatment of infectious diseases in animals (Forman and Burch, 1947). The presence of antimicrobial resistant, non-pathogenic commensal bacterial in farms are considered a problem, as it provides a pool of transferable resistance genes (De Francesco *et al.*, 2004). Besides, there is the problem of residual effects of drugs on animal products as well as high cost of the

drugs and coverage area. However, available evidence indicated that indigenous health practices including medicinal plants are still being used to handle animal health problems in all livestock production systems (Maeda-Machangu *et al.*, 1997, Minja, 1999). Since drugs and antibiotics are used in poultry feed to maximize the efficiency of production, product quality and control of diseases, plants and plant extracts from herbs and spices which are known to have medicinal properties can be used as alternatives to control diseases and improve feed efficiency. This is because they are known to contain bioactive compounds like tannins, saponins, alkaloids etc. that have inhibitory activities against disease causing organisms. Plant derived natural products represent an attractive source of antimicrobial agents since they are natural,

have manageable side effects and are available at affordable prices. Many of these plants extracts have also been used as feed additives and have been proven to improve gut integrity of monogastric animals. Consequently, plants and extracts from herbs and spices which are known to have medicinal properties are of paramount importance as alternatives for these purposes. One of such plants is coffee weed or septic weed (*Senna occidentalis*) which had been used as a natural medicinal plant in the rain forest and other tropical areas for decades. Its roots, leaves, flowers and seeds have been employed in herbal medicine around the world (Sambasivam *et al.*, 2016). It has been suggested that *Senna occidentalis* has the potential for the treatment of allergic and inflammatory diseases and that the various parts of plant are used in livestock production (Sreejith *et al.*, 2010). In previous studies, there was reduction of weight and delay of body growth among birds when the external seed tegument of *Senna occidentalis* was added to broiler chicken feed (Haraguchi *et al.*, 1998). However, Omoikhoje *et al.* (2018) observed no detrimental effect on the growth performance, carcass traits and internal organ of broiler chickens when different dosages of *Senna occidentalis* leaf aqueous extract were added to their drinking water. This study was therefore aimed at evaluating the effect of *Senna occidentalis* leaf ethanolic extract on the carcass traits and organ weights of broiler chickens.

Materials and methods

Experimental location and duration

The experiment was carried out at the Poultry Unit of the Livestock Teaching and Research Farm, Ambrose Alli University, Ekpoma for eight (8) weeks.

Sources of ingredients and fresh coffee

weed leaves

The ingredients for the broiler starter and finisher diets were purchased from a reputable feed dealer in Benin City, Edo State, Nigeria. Fresh coffee weed (*Senna occidentalis*) leaves were purchased from Ekpoma main market in Esan West Local Government Area, Edo State, Nigeria.

Processing of coffee weed leaves

The fresh leaves were thoroughly rinsed and sparsely spread on jute mat at room temperature for 6 – 7 days until they became crispy. The leaves were turned regularly to avoid uneven drying and decay to ensure that the greenish colour of the leaves was maintained. The dried crispy leaves were hammer milled and passed through a 2mm sieve and stored in an air tight plastic container to avoid the absorption of moisture till they were used for laboratory analysis and preparation of the ethanolic extract. A measured quantity (100g) of the ground leaves was infused in 400ml of ethanol overnight (12hours). Thereafter, the solution was filtered through a fibre sieve cloth. The filtrate was concentrated to dry form using a water bath at 60°C. A measured quantity (1.36g) of the filtrate was mixed in 1litre of water to serve as standard concentration, from which a measured quantity of the concentrate according to the experimental treatment was added to 1litre of drinking water and served to the birds *ad-libitum*.

Feeding and experimental treatments

The birds were fed commercial diet for one (1) week acclimatization period after which they were fed formulated starter and finisher diets (Table1). 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 ethanolic extract (CWLEE) per litre of drinking water, while 2.5g of synthetic antibiotic (Tyloxin, 100g/mL) was served to the birds as positive control (T₁) on a weekly interval.

Table 1: Nutrient composition of the formulated starter and finisher diets

Nutrient Composition %	Starter	Finisher
Maize	53.00	55.00
Soya bean meal	30.00	23.00
Fish meal	1.50	1.50
Palm kernel cake	5.60	8.00
Wheat offal	5.60	8.20
Bone meal	2.50	2.50
Limestone	1.00	1.00
Premix	0.30	0.30
Lysine	0.10	0.10
Methionine	0.10	0.10
Salt	0.30	0.30
Total	100.00	100.00
Calculated Analyses		
Crude Protein	21.22	19.11
Metabolizable Energy (Kcal/kg)	2809.39	2805.93

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 during which they were fed a commercial starter diet for one week acclimatization period. Thereafter, the coffee weed leaf ethanolic extract (CWLEE) at different dosages of 0, 25, 50, 75 and 100mL was added to their drinking water as T₁, T₂, T₃, T₄ and T₅ respectively. The birds were allowed free access to the diets and treatments *ad libitum* throughout the duration of the study. All routine management practices were carried out including vaccination.

Carcass traits and relative organ weights studies

At the end of the eight weeks feeding trial, all birds were fasted overnight and two (2) chickens were randomly selected from each replicate making a total of six (6) chickens per treatment group, tagged and their live weights taken. The slaughtered birds were dipped in hot water for about one (1) minute and the feathers were plucked and weighed

to get the plucked weights. The plucked chickens were eviscerated and weighed as eviscerated weights. The dressing percentage was expressed as the percentage ratio of the eviscerated weight to live weight. Thereafter, the carcass was cut into parts (drumstick, breast, thighs, wings, shanks, neck, back and head), while the viscera organs (liver, heart, lungs, gizzard, bursa, spleen and kidney) were excised, blotted free of blood and weighed. The weight of each of the cut parts and organs were expressed relative to the eviscerated weight of the birds.

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 (DMRT) as outlined by Steel and Torrie (1990) using the SPSS (2014) IBM version 20.

Results and discussion

The data on carcass characteristics as influenced by coffee weed ethanolic leaf extract (Table 2) indicated that live weight, defeathered weight, eviscerated weight, dressing percentage, drumstick and thigh weights were significantly affected by the treatments. While the relative weights of breast, wings, shank, neck, back and head

were not affected by the treatments. The higher live weight observed in birds on 50mL of coffee weed leaf ethanolic extract (CWLEE) compared to other treatments which translated to higher defeathered and eviscerated weights could be due to available protein and metabolizable energy, mineral and low anti-nutrient substances (Oloruntola *et al.*, 2016). The dressing percentage obtained in this study was within the range of 77.00 – 82.30%. The highest value (82.30%) was obtained in birds given 0mL CWLEE (control) but compared favourably with 81.82 and 81.69% recorded in broiler chickens that had 25 and 50mL CWLEE respectively. However, these values were higher than the range of 60.30 – 74.65% (Bamgbose *et al.*, 1999) but fell within the range of 77.33 – 83.00% (Akpodiete *et al.*, 1997) and lower than 79.84 – 86.96% (Omoikhoje *et al.*, 2018). Relative weight of drumstick and thigh of birds on 50mL CWLEE was better than those on other treatments, while thigh and breast were not different amongst the treatment groups. In the same vein, the relative weight of thigh was better for chickens served 50mL CWLEE, although did not differ from those of treatments 1, 2 and 5. The relative weight of wings, shank, neck, back and head were not significantly ($P>0.05$) influenced by the treatments and this supported the position of Tarek *et al.*

(2013) but disagreed with Nworgu *et al.* (2007). The improved relative weight of drumstick, thigh and breast for birds that had the CWLEE based treatments may be because of the better feed conversion ratio which accumulated into more muscle meat in the birds. This observation is in line with the report of Ghazalah and Ali (2008); that the use of herbs and its products in livestock feed and water to stimulate effective use of feed nutrient may result in more efficiency. This is because leaves contain active substances that can improve digestion and metabolism and possess bacterial and immunostimulant activities. In the light of this, Sultan *et al.* (2015) reported that the use of *Azadirachta indica* leaf extracts in broiler chicken production exhibited better nutrient digestibility of crude protein and ether extract coupled with improved intestinal histomorphology. This therefore suggests that coffee weed leaf ethanolic extract increased the ability of the birds to utilize available nutrients in the feed and the extract. Therefore, it can be alluded that better profit margin will be achieved for birds maintained on these treatments (2, 3, 4 and 5) because these cut parts are the valuable and highly priced cut parts. Consequently, it can be inferred that broiler chicken served 50mL CWLEE had a better carcass quality compared to other treatments.

Table 2: Carcass traits of broiler chickens as affected by the experimental treatments

Parameters	Experimental treatment (T)					SEM ±
	1	2	3	4	5	
	Dosages of CWLEE (mL)					
	0	25	50	75	100	
Live weight (kg/bird)	2.07 ^b	2.20 ^b	2.50 ^a	2.17 ^b	2.03 ^b	0.04
Defeathered weight (kg/bird)	1.90 ^b	2.00 ^b	2.30 ^a	2.03 ^b	1.93 ^b	0.05
Eviscerated weight (kg/bird)	1.70 ^b	1.80 ^b	2.00 ^a	1.77 ^b	1.57 ^c	0.03
Dressing percentage (%)	82.30 ^a	81.82 ^a	81.69 ^a	80.00 ^b	77.00 ^c	0.36
Cut Parts (%)						
Drumstick	15.21 ^b	15.28 ^b	16.60 ^a	14.51 ^c	13.62 ^d	0.11
Breast	17.11	18.02	20.37	18.54	18.08	1.12
Thighs	19.80 ^{ab}	19.24 ^b	22.28 ^a	17.93 ^b	21.14 ^{ab}	0.70
Wings	16.96	16.84	16.72	17.90	16.42	0.75
Shank	6.76	6.45	8.64	6.11	6.56	0.45
Neck	6.53	6.66	8.19	7.13	6.40	0.36
Back	7.13	7.48	9.03	7.68	7.52	0.35
Head	3.45	3.30	3.54	2.37	3.54	0.08

abc: Means in the same row with varying super scripts differ significantly ($P<0.05$)

The relative organ weights of broiler chickens (Table 3) showed that relative weights of liver were not significantly ($P>0.05$) influenced by the treatments, whereas, the relative weights of heart, lungs, gizzard, bursa, spleen and kidney were significantly ($P<0.05$) different amongst the treatment groups. This point to the fact that CWLEE did not cause any toxicity and abnormal metabolic activity in the organs or system of the birds as observed by Omoikhoje *et al.* (2018) when broiler chickens were administered coffee weed leaf aqueous extract. The relative weight of liver did not vary among birds on the entire treatment group and this may be ascribed to the quality of the test diets. This however negates the report of Omoikhoje *et al.* (2018) who observed significant variations in the relative weights of the liver of birds placed on coffee weed leaf aqueous extract. The relative weight of heart of birds placed on 75mL inclusion level of CWLEE was higher statistically but not different from the control and treatments 3 and 4. The lungs weight of birds placed on the control had higher value and differed from all other treatments but similar to those on treatments 3, 4 and 5. The weights of gizzards, bursa and spleen were higher in birds on 75mL CWLEE compared to other treatments but

for gizzard weight, the values in treatments 1, 2 and 5 were not different from another. Similarly, the values of bursa and spleen in treatments 1, 2, 4, 5 and 1, 2, 3 and 5 respectively were not different from one another. The relative weight of kidney was markedly higher in 100mL CWLEE compared to other treatments. However, the increased weight of the gizzard at 75mL dosage of CWLEE may be due to the high fibre content of the extract because increase in high fibre intake could lead to increase in gizzard weight. Besides, gizzard weight must increase due to increased activity of the organ to blend feed (Aderolu *et al.*, 2007). This observation agreed with the findings of Edache *et al.* (2017) on significant variation in the gizzard weights of colouring quails fed varying level of bakery whole meal. Furthermore, the non-significant variation in the values of the relative weights of the liver and the comparable values of the weights of the kidney in birds that had 25 and 50mL CWLEE to that in the control points to the fact that CWLEE did not illicit any toxic response. This is because these organs are keys to detoxification and did not undergo any hypertrophy (Tarimbuka *et al.*, 2017; Omoikhoje *et al.*, 2018)

Table 3: Relative organ weight of broiler chickens as affected by experimental treatments

Organs (%)	Experimental treatment (T)					SEM ±
	1	2	3	4	5	
	Dosages of CWLEE (ml)					
	0	25	50	75	100	
Liver	2.42	2.46	2.70	2.93	2.96	0.10
Heart	0.78 ^{ab}	0.67 ^b	0.71 ^{ab}	0.85 ^a	0.76 ^{ab}	0.03
Lungs	0.94 ^a	0.59 ^b	0.81 ^{ab}	0.70 ^{ab}	0.63 ^{ab}	0.03
Gizzard	3.02 ^{ab}	2.85 ^{ab}	2.49 ^b	3.61 ^a	3.21 ^{ab}	0.16
Bursa	0.81 ^b	0.89 ^b	0.88 ^b	1.43 ^a	1.42 ^a	0.03
Spleen	0.11 ^b	0.10 ^b	0.13 ^{ab}	0.17 ^a	0.13 ^{ab}	0.01
Kidney	0.19 ^c	0.22	0.25 ^{bc}	0.37 ^a	0.55 ^a	0.03

abc: Means in the same row with varying super scripts differ significantly ($P < 0.05$)

Conclusion

The inclusion of CWLEE at 50mL level in drinking water generally improved the carcass quality and normal functioning of the organs in broiler chickens. Therefore, 50mL of coffee weed leaf ethanolic extract can safely be used without any adverse effect on carcass quality and internal organ of broiler chickens.

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