CARCASS CHARACTERISTICS AND INTERNAL ORGANS PROPORTION OF BROILER CHICKENS ADMINISTERED WATER CONTAINING VARIOUS MEDICINAL PLANT LEAF METHANOL EXTRACT

Udokwu, I. U., Ekundayo, E. O., Onunkwo, D. N., Omosun, G., Ezeigbo, I. I., Ojimelukwe, P. C and Okolo, I. A
Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria
Corresponding author email: donunkwo1@gmail; +2348033388622

ABSTRACT
The discovery that the use of antibiotic in food animals is fueling the increasing problem of transmitting resistance bacteria from food animals to man has led to the search for an alternative to the use of antibiotics. To this end, the response of broiler chickens administered various medicinal plant methanol extract as a replacement for antibiotics was investigated. The plant extracts encompass four available leaves; *Gereinia kola* (Bitter Kola*), Alcornea cordifolia* (Christmas bush), *Pterocarpus santalinoides* (Red scandal wood) and *Chromolera Odorata* (Hagony or Siam weed). The experimental diet was same for all the treatment groups since the methanol extract of the leaves were administered in their drinking water against synthetic antibiotics. 180 unsexed Ross strain broiler chickens were randomly assigned to these dietary treatments which had 30 birds each. The treatments were replicated thrice with 10 birds per replicate in a Completely Randomized Design (CRD). Feed and water were provided *ad libitum* throughout the experiment which lasted for 56 days. Carcass characteristics and internal organ proportions were considered which differed significantly ($p<0.05$). Treatment 5 (*Alcornea Cordifolia*) had a significant reduction in abdominal fat when compared to the positive control group. The findings of this study conclude that the medicinal plant methanol extract has considerable potentials as component of broiler chickens'water. *Alcornea cordifolia* plant methanol extract can successfully be used to replace antibiotics for broiler production.
Keywords: Carcass characteristics, Organ proportion, antibiotics, medicinal plant, methanol extract, *Gercinia kola, Alcorneacordifolia, Pterocarpus santalinoides, Chromolena odorata*

INTRODUCTION
The use of antibioticson animals has been widely used for growth promotion and therapeutic treatment in the last decade has raised serious public health concern because of the increasing problem of antibiotic resistance among bacterial pathogens (Gradian *et al*, 2005). The widespread and often unregulated use of antibiotics to keep animals healthy and promote growth has been identified as a major factor responsible for breeding new forms of antibiotic resistance. The reservoir of resistant bacteria in food animals poses a potential risk of transfer of resistant bacteria or resistance genes from animals to humans (Singer and Peter, 2006).
Furthermore, the failure of antibiotics is increasing the cost of livestock production as well as economic losses due to untreated infections. The situation calls for an urgent need to search for alternatives to antibiotics which will produce the desired results in farms with minimal or no side effect to humans. New approaches that are receiving attention include vaccination, improvement of the gut bacteria flora using probiotics and prebiotics, use of phages, research on antimicrobial peptides and use of predatory bacteria (Ogle, 2016). One potential source of new antibacterial agents for use in poultry as replacement for antibiotics is medicinal plants.This study was conducted to determine the carcass characteristics and organ proportions of broiler chickens to four medicinal plant (*Gercinia kola, Alcornea cordifolia, Pterocarpus santalinoides* and *Chromolera odorata*) ethanol extract.

MATERIALS AND METHODS
This study was carried out in the Poultry unit of the Teaching and Research farm, Michael Okpara university of Agriculture, Umudike, Abia State. Umudike is located on latitude 05^{o} 21' N and longitude 07^{o} 33' E, with an elevation of about 112m above sea level. The location has an annual rainfall of 177 - 2,000mm per annum, (April to October) and a short period of dry season (November

to March) with a relative humidity of about 50-90% and monthly temperature range of 17^{o}C – 36^{o}C (NRCRI, 2019).

The fresh leaves of the medicinal plants investigated (*A. cordifolia*, *C. odorata*, *P. Santalinoides* and *G. kola*) were collected within Michael Okpara University of Agriculture, Umudike and air dried for two weeks under shade. The dried parts were pulverized to fine powder using a mechanical grinder, sieved and weighed.A total of 500g of each of the powdered plant materials was soaked in 1500ml of methanol for 24h at room temperature. The extracts were filtered using non-adsorbent muslin cloth into a clean beaker. The filtrate was dried by evaporating off the solvent at 50^{o}C in a hot air oven over a period of one to two days. The experimental design for the experiment was Completely Randomized Design (CRD) with medicinal plant methanol extract as the only factor of interest. The study lasted for 56 days.

A total of 180day-old Ross strained unsexed chicks were weighed and randomly allotted to six equal treatment groups (T1, T2, T3, T4, T5 and T6) each having 30 chicks. Each treatment was replicated three times of 10 chicks per replicate. T1 was the positive control, T2(Negative control), T3 (*Chromolaenaodorata)*, T4 (*Pterocarpussantalinoides)*, T5 (*Alchorneacordifolia)*and T6 (*Garcinia kola)*. Administration of medicinal plant methanol extract in their drinking water (1g/l of drinking water) commenced the first day of the experiment. Feed and water were given *ad libitum* throughout the experiment. Other management practices including prophylactic medications and vaccinations were carried out for positive control treatment only. The gross compositionof the experimental diet is presented in Table 1.

Data on carcass characteristics and organ proportion of the experimental birds were obtained from randomly selection of one bird from each of the replicate whose live weight was similar to the average weight of the treatment. All cut parts (breast, thigh, drumstick, wings and back) were weighed and expressed as percentage dressed weight while the head, neck, shanks and visceral organs (liver, heart, intestine, kidney, gizzard, caecum and spleen) were weighed immediately using sensitive scale and expressed as percentage dressed weight. All data generated were subjected to Analysis of Variance (ANOVA) and treatment means that were significantly different were separated using Duncan's Multiple Range Test (Duncan, 1955) according to Steel and Torrie (1980) using computer software IBM SPSS Statistic version 20 (SPSS, 2012).

RESULTS AND DISCUSSION

The result of carcass characteristics of broiler chickens fed various medicinal plant methanol extract is shown in Table 2. There was significant difference ($P<0.05$) among all the treatments.

It was observed that live weight at slaughter, dressed weight, dressing percentage, breast cut, head, neck, back cut, shank, thigh, wings and drum stick were significantly different ($p<0.05$) among the whole treatments. From the result of the present study, birds on treatment 5 showed the highest significance ($p < 0.05$) on dressing percentage (88.59%) which was statistically different from the other treatment.

However, treatment 1 showed the highest significance in neck, shank wings, breast cut and drum stick weight measured in percentage (6.63, 5.57, 12.67, 38.18 and 15.83) respectively which is statistically different from the other treatments. Nevertheless, treatment 6 gave the highest live weight, head weight and thigh (2800g, 3.84% and 18.09%) respectively which was statistically different from the rest of the treatments. Also, treatments 4 gave the highest dress weight (2176g) which was statistically different from the rest of the treatments. The amount of eviscerated carcass without neck, feet and giblets gives the carcass yield. The values expressed as percentage of liveweight gives carcass yield (dressed weight) percentage (Oyawoye and Ogunkunle 2004)

The range of values obtained for almost the cut-parts was higher with the normal range values of cut-parts provided by Oluyemi and Robert (2002) as follows:

Breast (17.40%), Wings (8.21%), Back cut (12.05%), Thighs (2.95%) and drumsticks (11.67%). The result shows that the fed plant methanol extracts supplied essential nutrients which were efficiently utilized in terms of digestion, absorption and assimilation thereby improving the carcass yield of the birds (Onunkwo and Ekine, 2020).

Table 1: Percent ingredients and nutrient composition of experimental diet

Parameters	Starter	Finisher
Maize	48.00	57.00
Soyabean meal	31.00	23.00
Fishmeal	3.00	3.00
Palm kernel meal	10.20	9.30
Wheat offal	4.00	4.00
Bone meal	3.00	3.00
Salt	0.25	0.25
Lysine	0.20	0.10
Methionine	0.10	0.10
Vit/Min premix	0.25	0.25
Total	100	100
Nutrient composition		
Crude protein (CP) (%)	22.98	19.63
Metabolizable energy (ME) (kcal/kg)	2883.22	2940.96

Table 2: carcass yield and cut-parts of broiler chicken fed medicinal plant methanol extract

Parameters	T1	T2	T3	T4	T5	T6	SEM
Live weight (kg)	2.40d	2.50c	2.55bc	2.60b	2.33e	2.80a	36.70
Dressed weight (kg)	1.56f	1.92c	1.820e	2.17a	2.07b	1.90d	47.31
Dressing percentage (%)	64.65f	76.81c	71.86d	84.10b	88.59a	67.92e	2.07
Breast cut (% of DWt)	38.18a	32.30d	34.94c	29.18f	31.49e	36.93b	0.76
Head	3.38c	3.32d	3.01e	3.55b	3.60b	3.84a	0.62
Neck	6.63a	5.61c	5.57c	4.87d	4.81e	6.42b	0.17
Back cut	20.94c	19.52d	21.91a	16.05f	17.68e	21.02b	0.50
Shank	5.57a	5.19c	4.14e	3.84f	5.11d	5.40b	0.16
Thigh	18.01b	15.68d	15.97c	14.43f	14.93e	18.09a	0.34
Wings	12.67a	10.44d	12.43b	10.42d	10.45d	11.68c	0.23
Drumstick	15.83a	14.28c	14.07d	11.70e	9.80f	15.05b	0.17

a–b-c Means with different superscripts in the same row are significantly different ($p<0.05$), S.E.M: Standard Error of mean.DWt: Dressed Weight.

The response on the internal organ proportion of broiler chickens fed various medicinal plant methanol extracts is presented in Table 3. The heart, gizzard, emptied proventiculus, liver, kidney, abdominal fat, spleen, lungs, crops, small and large intestine and pancreas were significantly ($p<0.05$) influenced by the medicinal plant methanol extract included in their drinking water. Liver weights on treatments 3, 4, 5 and 6 which were fed plant methanol extract were not significantly different ($p>0.05$) from another but significantly different ($p<0.05$) from treatment 1 and 2 which are positive and negative control. This sudden decreased liver weight of birds in treatments 6 may be associated with increased activity of the liver as a result of toxin present in the feed since the liver is the major organ for detoxification. This assertion generally agrees with the finding of Bone (1979) who reported that increased metabolic rate of organs in an attempt to reduce toxic substances in feed may cause abnormalities (increase) in their weights; this could also be attributed to the change in both the ability and functions of the liver during digestion as reported by Al-Harthi (2004).

The sudden increase in liver of *Gercina kola* which recorded the highest live weight corroborate with the report of Esiegwu and Udedibie (2009) who reported significantly heavier livers in Garcinia Kola groups than the control group for broiler chickens placed on similar treatment for 8 weeks.

For the kidney, it was observed that treatment 6 gave the highest significant ($p<.05$) value of 0.67% which is statistically different ($p<0.05$) from the rest of the treatment, however treatment 1, 2 and 5 showed no significant different ($p>0.05$) among them, also treatment 3 and 4 did not have any significant different ($p>0.05$) between each other.

Furthermore, for the heart, emptied proventiculus, small intestine and pancreas treatment 5 recorded the highest significant weight ($p<0.05$) which is statistically different ($p<0.05$) from the rest of the treatments. Treatment 2 as well gave the highest significant ($p<0.05$) weight for gizzard and spleen which is also statistically different ($p<0.05$) from the rest of the treatment. Treatment 6 recorded the highest weight of abdominal fat and pancreas which is also statistically different from the rest of the treatments.

Treatment 3 recorded the highest lungs weight which is also statistically different from the other treatments ($p<0.05$) and for the large intestine, treatment 2 recorded the highest weight in percentage which is also statistically different from the rest of the treatment ($p<0.05$).

Table 3: Organ proportion of broiler chicken fed medicinal plant methanol extract

Parameters	T1	T2	T3	T4	T5	T6	SEM
Heart	0.57^{a}	0.40^{c}	0.50^{b}	0.54^{ab}	0.56^{a}	0.43^{ac}	0.17
Gizzard	1.50^{b}	1.68^{a}	1.36^{c}	1.47^{b}	1.50^{b}	1.36^{c}	0.27
Emptied Proventriculus	0.42^{ab}	0.39^{abc}	$0.37b^{c}$	0.35^{c}	0.43^{a}	0.39^{abc}	0.09
Liver	1.96^{c}	1.71^{d}	2.16^{a}	2.15^{a}	2.05^{b}	2.18^{a}	0.40
Kidney	0.45^{c}	0.44^{c}	0.54^{b}	0.54^{b}	0.45^{c}	0.67^{a}	0.21
Abdominal fat	1.44^{b}	0.72^{f}	1.29^{c}	1.21^{d}	0.81^{e}	1.85^{a}	0.92
Spleen	0.17^{ab}	0.19^{a}	0.16^{ab}	0.17^{ab}	0.13^{b}	0.17^{ab}	0.08
Lungs	0.42^{d}	0.60^{b}	0.69^{a}	0.50^{c}	0.59^{b}	0.49^{c}	0.52
Crop	0.36^{b}	0.35^{b}	0.35^{b}	0.24^{c}	0.39^{b}	0.54^{a}	0.22
Small Intestines	2.38^{b}	2.11^{d}	2.22^{c}	1.92^{e}	2.79^{a}	1.70^{f}	0.84
Large Intestines	0.46^{b}	0.56^{a}	0.43^{b}	0.42^{b}	0.34^{c}	0.35^{c}	0.19
Pancreas	0.21^{cd}	0.27^{b}	0.22^{bcd}	$0.26b^{c}$	0.49^{a}	0.20^{d}	0.25

a–b-c Means with different superscripts in the same row are significantly different ($p<0.05$), S.E.M: Standard Error of mean.

CONCLUSION

The findings of this study conclude that the medicinal plant methanol extract has considerable potentials as component of broiler chickens' water. *Alcornea cordifolia* plant methanol extract can successfully be used to replace antibiotics for broiler production.

REFERENCES

Al-Harth, M.A(2004). Efficiency of utilizing some species and herbs with or without antibiotics supplementation on growth performance and carcass characteristics of broiler chickens. Egypt Poultry Science Journal, 9: 13-23

Bone, F. J. (1979). Anatomy and Physiology of Farm Animals. Printice–Hall, Inc., New Jersey, U.S.A.

Esiegwu AC and ABI Udedibie, (2009). Growth performance of and anti-microbial activities in broilers fed supplementary bitter kola (*Garcinia kola*). Anim Prod Res Adv, 5: 20-24.

Grandin, Temple; Johnson, Catherine (2005). Animals in Translation. *New York, NY: Scribner*. p. 183. ISBN 0-7432-4769-8

Ogle, Maureen. (2016). Riots, Rage, and Resistance: A Brief History of How Antibiotics Arrived on the Farm". Scientific American

Onunkwo, D. N. and Ekine, O. A (2020). Performance of broiler chickens fed diet containing fermented maize milling waste. *Nigerian Journal of Animal Production*, 47(1): 214 – 220

Oyawoye, B. M. and Ogunkunle, H. N. (2004). Biochemical and haematological reference values in normal experimental animals, Pp. 212-218. New York: Mission

NRCRI (2019). Agro-meterologic unit, National Root Crops Research Institute, Umudike, Umuahia, Nig

Duncan, D.B. (1955). Multiple range and multiple F tests. Biometrics, 11:1-42.

Steel, R. G. D. and Torrie, J. H. (1980). Principle and Procedures of Statistics: A Biometrical Approach 2nd ed. McGraw-Hill Book Co., Inc., New York, USA.

Singer and Peter (2006).In Defense of Animals. Wiley-Blackwell. p. 176. ISBN 1-4051-19411.
SPSS (2012). Statistical Package for Social Science, SPSS 20 for Windows. SPSS Inc. Chicago, Illinois