EFFECTS OF *TETRAPLEURA TETRAPTERA* ON PERFORMANCE, CARCASS CHARACTERISTICS AND ORGAN INDICES OF BROILER CHICKENS

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Received *April 28, 2021;* ***Revised*** *July 20, 2021;* ***Accepted*** *July 26, 2021*

ABSTRACT

This study was conducted to determine the effect of Tetrapleura tetraptera as a feed additive on growth performance, carcass and internal organs of broiler chickens. 240 day-old broiler chickens were used for the study. Four dietary treatments were formulated. Treatment one (T_1), the control had no T. tetraptera powder, while treatments two, three and four (T_2, T_3 and T_4) had 100, 150 and 200 g per 100 kg of feed respectively. The birds were divided into four groups with sixteen replicates of fifteen birds each and assigned treatment diets in a completely randomized design. Feed and water were offered ad libitum. The result on the performance of the birds at the starter phase showed significant differences ($p<0.05$) in daily weight gain and feed conversion ratio. The feed intake of the birds in the starter phase was statistically similar across treatments. In the finisher phase, final weight, daily weight gain and feed conversion ratio were significantly affected ($p<0.05$) by the diet in the finisher phase significant difference ($p>0.05$) did not exist in the feed intake of the birds across treatment. There were significant differences ($p<0.05$) in the live weight, dressed weight, cut-parts, and internal organs of the chickens. Significant differences ($p>0.05$) did not exist in the internal organs of the chickens. It can be concluded that inclusion of T. tetraptera powder up to 200 g in the diet of broiler chicken enhanced growth performance, carcass and did not have any adverse effect on the internal organs of the chickens.

Keywords*:* Broiler chicken, *Tetrapleura tetraptera*, Carcass, Internal organ

INTRODUCTION

Poultry meat and eggs are significant sources of dietary protein. Consumption of these poultry products is also increasing faster than other livestock, with feed constituting about 70 – 80 % of the entire expenses in poultry production. Although, high quality and adequate quantity feed may be provided the amount of feed digested, nutrient absorbed and utilized is very important. Generally digestion in poultry may among other factor depend on the micro-organisms that naturally inhabit and colonized the digestive tract (Denli *et al*., 2003; Odoemelam *et al*., 2012). Feed additive like antibiotic have been used for these purpose at subtherapeutic doses in poultry diets (Enerberg *et al.,* 2000). They act directly against pathogens in the gut creating a favourable environment for protein and energy digestion, absorption and utilization (Dittoe *et al*., 2018). Birds raised with these feed additives achieved good performance but the potential side effects which include host drugs resistant present a real public health concern globally (Al-Harthi, 2002) and has led to the ban of these product by many countries of the world (Cardozo *et al.,* 2004; Kehinde *et al.,* 2011). The search for natural and safe alternative additive to reduce the cost of disease treatments and enhanced livestock production, which will safe guard public health, has resulted to the introduction of many herbal products in livestock diets (Cardozo *et al*., 2004). Spices and herbal product have

been found to be useful to man because of their nutritional and medicinal properties (Czarra, 2009). Some of these useful herbs and spices are indigenous to Africa and have been reported to influence nutrient utilization in chickens (Denli *et al.,* 2003). These natural herbs and spices are readily available at a lower cost with limited side effect and with minimal or no residues in their products. Spices and herbal products are in form of rhizome, leaves, knot, bulb, seeds and fruits. Examples includes: *Alium sativium* L. (garlic), *Pepper nigrum* L. (black pepper), *Zingiber officinale* Roscoe (ginger), *Ocimum gratissimum* L. (scent leaf) and many others. These spices and herbs are known to improve food palatability through their aroma (Dougkas *et al.,* 2019), improve digestion by enhancing endogenous digestive enzymes secretion (Zhang *et al*., 2009), improve immune system response and possession of antibacterial, antiviral and antioxidant properties (Jamroz *et. al.,* 2003) and improve the utilization of digestive products (Iqbal *et. al.,* 2001; Greathead, 2003).

Tetrapleura tetraptera (Schum and Thonn) commonly known as Aridan, Uhio in Igbo and Uyayak in Efik and Ibibio may be used as a natural feed additive in poultry diets. *T. tetraptera* is a flowering plant in the pea family. It belongs to the order Fabales and family Fabaleae. It is a delicious tree which grows to approximately 20 – 25 metre in height. The fruit is brownish in colour and measures 15 – 25 cm long. The fruit is distinguished by its four longitudinal ridges that are slightly curved. Two of the ridges are woody while the order two contains soft aromatic pulp. The pod or fruit contains tinny hard seeds that measures approximately 8 mm long (Orwa *et. al.,* 2009). *T. tetraptera* is highly sought after due to its high medicinal and aromatic values. It is used as spice in many Nigerian cuisines. Aladesanmi (2007) reported that the fruits have strong molluscidal antimicrobial, antivulsant, insectidal activities and are important compounds for the management of collection of ailment, including diabetes, arthritis, malaria fever and hypertension. Similarly, Ojewole and Adewunmi (2004) reported that *T. tetraptera* is a rich source of phytochemicals which contribute its biological and pharmacological activities including cardiovascular, antiinflamatory, hypoglycemic, hypotensive, neuromuscular, anti-convulsant, molluscidal, trypanocidal, anti-ulcerative, ectoxicity, anti-microbial, emulsifying property, bird control, food value, and control of intestinal parasites. Also, Osei-Tutu *et al.* (2010) reported that *T. tetraptera* is mainly used as spice, medicine and as dietary supplements rich in vitamins. *T. tetraptera* is reported to contain some bioactive substances such as saponin, phenolic compounds, alkaloid, steroid and flavonoid which are responsible for its varied biological and pharmacological activities (Okwu, 2003). The author further reported that the fruit is rich in minerals such as iron, calcium, magnesium, potassium and zinc.

Arising from the above background, this study was carried out to evaluate the nutritional quality of the fruit by assessing its effect as feed additive on the performance, carcass and organs qualities of broilers chickens.

MATERIALS AND METHODS

The experiment was carried out at the Poultry Research Unit of the Department of Animal Science, Akwa Ibom State University, Obio Akpa Campus located between latitude 5^0 17^1N and between longitude $7^0 27^1$N and $7^0 58^1$E with annual rainfall ranges of 3500 – 5000 mm, average monthly temperature of 25.0 ± 2.1^0C and relative humidity between 60 – 90 % (Wikipedia, 2020).

Source and Processing Method: *T. tetraptera* fruits used in this study were purchased from Abak market, Abak Local Government Area in Akwa Ibom State. The fruits were cut into tiny pieces, sundried for seven days and ground into powder using a manual blender (Corona 1016, Landersy Y. CIA, South Africa).

Toxicity and Phytochemical (Anti-Nutritive Factors) Assay of *Tetrapleura tetraptera:* The acute toxicity test of *T. tetraptera* was adopted from the study of Noamesi *et al.* (1994) that used brine shrimp acute toxicity assay, while the phytochemicals assay was adopted

from the studies of Dosunmu (1997) and Ojewole and Adewunmi (2004).

Proximate Analysis of *Tetrapleura tetraptera*: Sample of grounded *T. tetraptera* were subjected to proximate analysis for the determination of crude protein, ether extract, crude fibre, ash and moisture, using the guide provided by AOAC (1995).

Experimental Diets: Four (4) experimental diets were formulated at starter and finisher phases. The diets were labeled T_1, T_2, T_3 and T_4. Treatment one (T_1) the control had no *T. tetraptera* powder, while T_2, T_3 and T_4 had 100, 150 and 200 g per 100 kg of feed. Ingredients and nutrients composition of the experimental broiler diet is represented in Tables 1 and 2.

Management of Experimental Birds and Layout of the Experiment: The ethical guideline for the use of birds in experimentation adopted in this research was that of NENT (2018). The house was washed, disinfected and left to air-dry for two weeks before the arrival of the chicks. A total of two hundred and forty day-old (Abor acre) broiler chicks were used for the research. The chicks were purchased from a reputable poultry shop in Uyo, Akwa Ibom State. On arrival the initial weight of the birds were taken before they were randomly allotted to four treatments T_1, T_2, T_3 and T_4 with four replicate of 15 birds per replicate in a completely randomized design. Laying hens were housed in a deep litter pen; feed and water were supplied *ad libitum*. Litter materials were changed biweekly. The birds were kept on the starter diet from week 1 to 4 and on the finisher diet from week 5 to 8. At the end of the starter phase birds were weighed and reshuffle to have group of birds with similar body weight to start the finishing phase and were assigned finisher diets. Birds were routinely vaccinated against Marek disease, New Castle disease, and Infectious bursal disease between day 1 and 7 weeks of age (Stewart-Brown, 2015)

Data Collection: The body weights of the birds were obtained weekly. The weight gain was calculated by subtracting the initial weight from the final weight. Feed intake of the birds was calculated by subtracting the quantity of the left over feed from the quantity of feed fed the previous day. Feed conversion ratio was calculated by dividing the daily feed intake by daily weight gain.

Carcass and Organ Weight Evaluation: After the end of the eight weeks three birds were randomly selected from each of the replicates for carcass analysis. The birds were starved overnight of feed, weighed, slaughtered and allowed to bled thoroughly before scalding in hot water. The birds were defeathered, eviscerated and weighed to determine the carcass yield. The dressed weight, thigh, drumstick, breast and internal organ (liver, heart, gizzard and kidney) weight were expressed as percentage of live weight.

Data Analysis: All data collected were subjected to analysis of variance (ANOVA) (SAS, 2002), and significant means were separated using Duncan multiple range test (Duncan, 1955)

RESULTS AND DISCUSSION

Toxicity, Phytochemical and Proximate Composition of *Tetrapleura tetraptera:* The acute toxicity of *T. tetraptera* (LC_{50}) was calculated as 438 µg/ml (Noamesi *et al.,* 1994). The sublethal doses used in this study were non-toxic thus safe. According to Dosunmu (1997), *T. tetraptera* contains oxalates (8.14 – 16.6 mg/100g), tannin (16.5 – 35.7 mg/100g) and HCN (98 – 100 mg/100g). Ojewole and Adewunmi (2004) reported the presence of 1 – 20 % saponin, 2.5 % flavonoid, 0.12 % tannin, 1 % alkaloid and 5 % phytate. Other compositions are alkaloids (2.88 mg/100g), tannins (1.46 mg/100g), saponins (1.07 mg/100g), flavonoids (0.73 mg/100g), phenols (0.51 mg/100g) (Udo, 2020).

Flavonoids possess antioxidant properties as they reduce lipid peroxidation, thus a major factor in the organoleptic characteristics and nutritional value of meat and egg in poultry (Hager-Theodorides *et al.*, 2014).

Table 1: Gross composition of experimental broiler starter diet

Ingredients	T_1 (0 g TTP control)	T_2 (100 g TTP)	T_3 (150 g TTP)	T_4 (200 g TTP)
Yellow maize	50.00	50.00	50.00	50.00
Soya beans meal	25.00	25.00	25.00	25.00
Blood meal	3.00	3.00	3.00	3.00
Fish meal	3.00	3.00	3.00	3.00
Palm kernel cake	5.00	5.00	5.00	5.00
Wheat offal	9.00	9.00	9.00	9.00
Bone meat	4.00	4.00	4.00	4.00
Common salt	0.25	0.25	0.25	0.25
Mineral/vitamin premix*	0.25	0.25	0.25	0.25
L-Lysine	0.25	0.25	0.25	0.25
L-Methionine	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**
Calculated Chemical Composition (% DM)				
Crude protein	22.92	22.92	22.92	22.92
Ether extract	4.09	4.09	4.09	4.09
Crude fibre	3.15	3.15	3.15	3.15
ASH	3.57	3.57	3.57	3.57
NFE	66.27	66.27	66.27	66.27
ME(MCH/kg)	2879.85	2879.85	2879.85	2879.85

*TTP = Tetrapleura tetraptera powder; DM = dry matter; *To provide the following per Kg of feed: Vitamin A, 10,000 IU; Vitamin D3, 2000 IU; Vitamin E, 12 mg; vitamin K, 2 mg; Vitamin K, 2 mg; vitamin B1, 1,5 mg; Vitamin B2, 4 mg; vitamin B6, 1.5 mg; vitamin B12, 12 mg; Niacin, 15 mg; Panthothenic acid, 5 mg; Folic acid, 5 mg; Biotin, 2 mg; choline chloride, 100 mg; manganese, 75 mg; Zinc, 5 mg; iron, 2 mg; Copper, 5 mg; iodine, 1.0 mg; Selenium, 2.0 mg; cobalt, 5 mg; Anti-oxidant, 125 mg*

Table 2: Gross composition of experimental broiler finisher diets

Ingredients	T_1 (0 g TTP control)	T_2 (100 g TTP)	T_3 (150 g TTP)	T_4 (200 g TTP)
Maize	55.00	55.00	55.00	55.00
Soya bean meal	20.00	20.00	20.00	20.00
Blood meal	3.00	3.00	3.00	3.00
Fish meal	3.00	3.00	3.00	3.00
Wheat offal	9.00	9.00	9.00	9.00
Palm kernel cake	5.00	5.00	5.00	5.00
Bone meal	4.00	4.00	4.00	4.00
Common salt	0.25	0.25	0.25	0.25
Mineral/vitamin premix*	0.25	0.25	0.25	0.25
L-lysine	0.25	0.25	0.25	0.25
L-Methionine	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**
Calculated chemical composition (% DM)				
Crude protein	21.37	21.37	21.37	21.37
Crude fibre	4.32	4.32	4.32	4.32
Ether extract	3.96	3.96	3.96	3.96
ASH	5.25	5.25	5.25	5.25
NFE	65.10	65.10	65.10	65.10
ME (Mcal/kg)	2911.02	2911.02	2911.02	2911.02

*TTP = Tetrapleura tetraptera powder; DM = dry matter; *To provide the following per Kg of feed: Vitamin A, 10,000 IU; Vitamin D3, 2000 IU; Vitamin E, 12 mg; vitamin K, 2 mg; Vitamin K, 2 mg; vitamin B1, 1,5 mg; Vitamin B2, 4 mg; vitamin B6, 1.5 mg; vitamin B12, 12 mg; Niacin, 15 mg; Panthothenic acid, 5 mg; Folic acid, 5 mg; Biotin, 2 mg; choline chloride, 100 mg; manganese, 75 mg; Zinc, 5 mg; iron, 2 mg; Copper, 5 mg; iodine, 1.0 mg; Selenium, 2.0 mg; cobalt, 5 mg; Anti-oxidant, 125 mg*

Saponin enhances immune stimulation in poultry. Saponin helps to lower the total cholesterol in broiler meat (Berezin *et al.*, 2010). Tannin in diet of broiler chickens enhances body weight, higher erythrocyte count as well as haemoglobin and haematocrit (Perin *et al.,* 2019). Phenol enhances feed utilization, growth performance, decreased lipid oxidation, decreased cholesterol value and increased beneficial fatty acid content (Starčević *et al.,* 2015). Alkaloids increase feed intake, weight gain, regulates metabolic processes, innate immune system and digestive functioning in poultry (Ni *et al.,* 2016).

The results of the proximate composition of *T. tetraptera* fruits showed that the dry fruit contains 7.51 % crude protein, 10.13 % crude fibre, 4.11 % ether extract and 6.14 % ash (Table 3).

Table 3: Proximate composition of (% DM) *Tetrapleura tetraptera*

Parameters	TTP
Crude protein	7.51
Crude fibre	10.13
Ether extract	4.11
ASH	6.14
NFE	61.11
Dry Matter	89.0
Anti-nutrient (mg/100g)	
Tannin	1.82
Saponin	1.63
Flavonoid	2.57
Alkaloid	1.30
Phenol	3.21

TTP = Tetrapleura tetraptera powder

The rich nutrient content of the fruit indicated that it can be used as a feed additive. The high level of ash in the dry fruit agrees with the report of Dosunmu (1997) and Okwu (2003) who stated that dry fruit of *T. tetraptera* is rich in minerals such as iron, calcium, magnesium, potassium, phosphorous and zinc.

There were significant differences ($p<0.05$) in the final body weight, average body weight values of the birds in the starter phase. T_4 had the highest significant ($p<0.05$) values for the two parameters. T_3 T_2 and T_1 were statistically similar (Table 4). This result could suggest increase in digestive fluid which could in turn speed up the digestive and absorption process. This result is in consonant with the report of Odunowo and Olumide (2019) where broilers fed diets supplemented with garlic showed significant differences ($p<0.05$) in their final body weight and average body weights values. The result also agrees with the findings of Daramola *et al.* (2020) who reported a significant increase ($p<0.05$) in final body weight and average body weight of Turkey poults fed diets containing 0.6 % ginger, over those fed 0.2 and 0.4 %.

The feed intake of the birds in all treatments group in the starter phase was statistically similar. The feed conversion ratio of the birds were not significantly ($p>0.05$) affected by the diet T_4 had the best and the lowest feed conversion ratio, suggesting that the nutrient in the feed were efficiently and effectively utilized. The result obtained for FCR agrees with the report of Ekine *et al.* (2020) where birds fed the highest dietary level of turmeric had the best and lowest significant ($p<0.05$) FCR value.

In the finisher phase, the final weight gain and average weight gain of the broiler chicken indicated significant differences ($p<0.05$) in their values. T_4 recorded the highest significant ($p<0.05$) value for the two parameters followed by T_3 which was significantly higher ($p<0.05$) than T_2 and T_3. The values for T_2 and T_1 were statistically similar (Table 4). The average body weight and the final body weight increases as the level of *T. tetraptera* powder increase in the diet. The result obtain in this study may be attributed to the beneficial effects of the phytochemicals in *T. tetraptera* which help to improve growth performance of bird through improve digestion by enhancement of endogenous digestive enzyme secretions and also creating a favourable environment in the gut for digestion, protein and energy absorption and utilization (Okwu, 2003; Ingweye *et al.*, 2020). In a similar study using garlic Odunowo and Olumide (2019) observed significant difference ($p<0.05$) in the average body weight of broilers fed garlic as an additive in finisher's diet. Birds fed the highest inclusion level (6 %) recorded highest significant ($p<0.05$) average body weight value.

Table 4: Performance characteristics of broiler chicken feed starter diet containing varying levels of *Tetrapleura tetraptera* powder

Parameters	T_1 (0 g TTP control)	T_2 (100 g TTP)	T_3 (150 g TTP)	T_4 (200 g TTP)
Initial body Weight (g)	400.11 ± 2.21	398.81 ± 2.18	401.01 ± 2.22	400.21 ± 2.21
Final body weight (g)	1118.01 ± 11.02^a	1109.86 ± 10.51^a	1125.56 ± 10.01^a	1145.56 ± 10.53 ^{b}
Body weight gain (g)	717.90 ± 3.12^a	711.05 ± 3.08^a	724.55 ± 3.36^b	745.35 ± 3.70^c
Daily weight gain (g)	25.64 ± 0.17^a	25.39 ± 0.14^a	25.88 ± 0.19^a	26.62 ± 0.16^b
Feed intake (g)	55.11 ± 1.31	54.91 ± 1.19	55.13 ± 1.31	54.87 ± 1.18
Feed conversion ratio	2.14 ± 0.16^b	2.17 ± 0.18^b	2.13 ± 0.16^b	2.06 ± 0.14^a
Mortality	0.00	0.00	0.00	0.00

TTP = Tetrapleura tetraptera powder; Means in the same row with varying letter superscript differ significantly (p<0.05)

Ademola *et al.* (2005) reported that the mixture of ginger and garlic improved growth and feed conversion in broiler birds.

The feed intake of the birds in the finisher phase was not significantly different (p>0.05) in their values across treatment. T_4 had the highest numerical value followed by T_3, T_2 and T_1 (Table 5). This result showed that the feed intake of the birds increased as the level of *T. tetraptera* increased in the diet. This result suggests the ability of *T. tetraptera* to stimulate appetite as well as improving feed intake. The result is in agreement with the observations of Duwa *et al.* (2019) who recorded no significant difference (p>0.05) in feed intake values of broilers fed diet containing ginger.

The feed conversion ratio of the birds in the finisher phase indicated significant differences (p<0.05) in their values across treatment. T_4 had the best and the lowest feed conversion ratio which was significantly lower (p<0.05) than T_3, T_2, and T_1. The result obtained in this study agrees with Tollba and Hassan (2003) who reported that feed additives are generally used to improve feed intake and to increase growth rate in broilers. For many years, feed additives have been widely used to increase animals' performance and recently it is used in poultry industry to improve growth, feed efficiency and layer's performance (Tollba and Hassan, 2003; Khan *et al.*, 2007; Abouelfetouh and Moussa, 2012).

The result of the carcass characteristic showed that significant (P<0.05) differences existed in the live weight, dressed weight and dressing percentages of the birds. Birds in T_4 group recorded the highest significant (p<0.05) value for the three parameters. This result is similar with the result of Odunowo and Olumide (2019) who observed significant differences (p<0.05) in the value for live weight, dressed weight and dressing percentages of broiler birds fed diet containing garlic. The result obtained in this study could be attributed to the positive relationship between weight gain and dressed weight where heavy animals are expected to produce greater dressed weight. In this study, T_4 recorded the highest average weight gain which also reflected in live weight and dressed weights of birds in that group.

The dressing out percentages of the experimental birds fed *T. tetraptera* supplemented diets values fall within the range 60.30 – 74.65 % recommended for broiler chicken (Onibi *et al.,* 2009).

Significant difference (p<0.05) existed in abdominal weight values. Birds in T_4 and T_2 showed significant reduction (p<0.05) in abdominal fat values, while T_1 had the highest significant (p<0.05) abdominal fat value which was similar to T_2. This result suggested that *T. tetraptera* was able to reduce the abdominal fat and by implication lowers the cholesterol and triglyceride levels in the carcass of broilers on 150 and 200 g *T. tetraptera* additive. Invariably, these birds produced better quality meat that has less fat content. The lowering of fat contents on the broiler carcass by *T. tetraptera* may be useful in reducing the cardio-vascular disease in human. The result obtained in this study is in agreement with the findings of Ademola *et al.* (2009), Valiollahi *et al.* (2014) and Eltazi (2014) that the addition of ginger and essential oil to broilers diet reduced significantly

Table 5: Performance characteristics of broiler chicken fed finisher diet containing varying levels of *Tetrapleura tetraptera* powder

Parameters	T_1 (0 g TTP control)	T_2 (100 g TTP)	T_3 (150 g TTP)	T_4 (200 g TTP)
Initial body Weight(g)	980.51 ± 6.38	979.65 ± 5.99	983.10 ± 6.39	985.10 ± 6.42
Final body weight (g)	2413.18 ± 17.38^a	2425.11 ± 17.39^a	2550.01 ± 17.58^b	2600.01 ± 17. 78^c
Body weight gain (g)	1432.67 ± 12.21^a	1445.46 ± 12.43^b	1566.91 ± 12.81^c	1614.91 ± 12.98^d
Daily weight gain (g)	51.17 ± 1.28^a	51.62 ± 1.30^a	55.96 ± 1.45^b	57.68 ± 1.78^c
Feed intake (g)	130.00 ± 1.96	130.03 ± 1.97	135.01 ± 1.99	131.01 ± 1.98
Feed conversion ratio	2.54 ± 0.28^c	2.52 ± 0.27^c	2.41 ± 0.25^b	2.27 ± 0.21^a
Mortality	0.00	0.00	0.00	0.00

TTP = Tetrapleura tetraptera powder; Means in the same row with varying letter superscript differ significantly ($p<0.05$)

the abdominal fat of the chicken. *T. tetraptera* fruit powder can be effective and beneficial in regulating excessive fat deposition, triglycerides and cholesterol levels in humans and animals because of his antioxidant properties. These findings confirmed the anti-lipidimic and hypo-lipidimic properties of *T. tetraptera* fruit. The findings also lend pharmacological credence to the suggested Folkloric uses of the plant in the management and control of obesity, arthritis, inflammatory condition and other diseases in some Efik and Ibibio speaking groups in the South-south part of Nigeria.

The primal cut-parts (breast, drumstick, thigh and wing) indicated significant differences ($p<0.05$) in their values. Birds in T_4 recorded the highest significant value ($p<0.05$) for breast, drumstick, thigh and wing followed by T_3, T_2 and T_1. The result of the carcass and organs of the birds is represented in Table 6.

The results of the organs (heart, kidney, gizzard and liver) had no significant variations in their values across treatments. The result indicated that *T. tetraptera* had no negative effect on organs of the birds. The result suggested the organs were able to perform their biotransformation functions.

Conclusion: This study revealed that the inclusion of *T. tetraptera* in broiler diet has been found to enhance growth performance, carcass traits of broilers chickens when fed up to 200 g / 100 kg of *T. tetraptera* in their diets. The use of *T. tetraptera* will be useful in organic poultry production and poultry production in rural areas where there is reduced accessibility to conventional medications.

ACKNOWLEDGEMENTS

I acknowledge with gratitude, the painstaking reading and reviews of this article by the peer reviewers, whose insightful contributions have given this work a facelift. I acknowledge the authors whose academic works I have consulted to enrich the academic prowess of this work. I appreciate my creator for the good health, knowledge and strength to carry out this work successfully.

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Table 6: Carcasss and organ weights of broiler chicken fed finisher diet containing varying levels of *Tetrapleura Tetraptera* powder

Parameters	T_1 (0 g TTP control)	T_2 (100 g TTP)	T_3 (150 g TTP)	T_4 (200 g TTP)
Live weight (kg)	2.30 ± 0.82	2.32 ± 0.85	2.40 ± 0.87	2.58 ± 0.98
Dressed weight (kg)	1.53 ± 0.26^a	1.52 ± 0.23^a	1.64 ± 0.31^b	1.80 ± 0.48^c
Dressing percent (%)	66.00 ± 1.84^b	65.00 ± 1.81^a	68.00 ± 1.91^c	69.78 ± 1.97^d
Cut-up parts				
Breast (g)	253.33 ± 3.81^a	253.67 ± 3.75^a	257.21 ± 3.83^b	265.05 ± 3.97^c
Thigh (g)	117.33 ± 2.01^b	113.01 ± 1.92^a	128.41 ± 2.13^c	158.46 ± 2.52^d
Wing (g)	74.31 ± 1.98^a	74.81 ± 1.99^a	87.80 ± 2.11^b	92.91 ± 2.24^c
Drum stick (g)	93.01 ± 2.25^b	92.51 ± 2.21^a	95.51 ± 2.31^c	98.57 ± 2.42^d
Internal organs (%LW)				
Heart	0.39 ± 0.02	0.37 ± 0.01	0.39 ± 0.02	0.36 ± 0.01
Liver	2.08 ± 0.11	2.10 ± 0.12	2.05 ± 0.11	2.08 ± 0.01
Lizard	1.53 ± 0.08	1.59 ± 0.09	1.55 ± 0.08	1.59 ± 0.09
Kidney	0.15 ± 0.01	0.15 ± 0.01	0.13 ± 0.01	0.16 ± 0.01
Abdominal fat	0.92 ± 0.04	0.62 ± 0.03	0.41 ± 0.02	0.30 ± 0.01

TTP = Tetrapleura tetraptera powder; Means in the same row with varying letter superscript differ significantly ($p<0.05$)

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