



## Effect of *Xylopia aethiopica* on Growth and Carcass Characteristics of Broiler Chickens.

Solomon, F. E., Essien, C. A. and Eyoh, G. D.

Department of Animal Science, Akwa Ibom State University

### Abstract

This study was conducted to determine the effect of *xylopia aethiopica* on growth performance, carcass characteristics and internal organs of broiler chickens. Two hundred day old abor acre broiler chickens were used for the study. Five dietary treatments were formulated thus; Treatment one ( $T_1$ ); the control had no *xylopia aethiopica* powder, while treatments two, three, four and five ( $T_2$ ,  $T_3$ ,  $T_4$  and  $T_5$ , respectively) had 100, 200, 300 and 400 g per 100 kg of feed, respectively. The birds were divided into five treatment groups of forty birds each and assigned treatment diets in a completely randomized design. Feed and water were offered ad libitum. The results of growth performance of the birds at the starter and finisher phases showed significant ( $p < 0.05$ ) effect of *xylopia aethiopica* on daily and final weight gains. However, feed intake and feed conversion ratio were not significantly ( $p > 0.05$ ) affected. There were significant ( $p < 0.05$ ) treatment effect on live and dressed weights. Significant differences ( $p > 0.05$ ) did not exist in the weight of cut-up parts (thigh, drumstick, breast, wing and back) and internal organs (gizzard, liver, kidney and heart) of the broiler chickens. It can be concluded that inclusion of up to 400 g of *xylopia aethiopica* powder in the diet of broiler chickens improved growth performance but did not have any detrimental effect on carcass characteristics and internal organs of the broiler chickens.

**Keywords:** Broiler chickens, *xylopia aethiopica*, performance, carcass, internal organs.

### Introduction

Livestock production especially the poultry sector is one of the fastest way of getting sufficient animal protein due to their fast growth rate. Consumption of these poultry products which are good sources of dietary protein has constantly risen over the years (Zafar *et al.*; (2005). In raising broiler chickens, rapid growth is important to achieve maximum productivity which would reflect in the gross margins (Oluyemi and Roberts, 2000). The quantity of feed digested and nutrient absorbed and utilized is very vital though high quality and sufficient quantity of feed may be provided. Digestion in broiler chickens depends on the micro-organisms that naturally inhabit and colonize the digestive tract (Denli *et al.*, 2003; Ndelekwute, 2012). This therefore raises the need to formulate diets for its effects on gut health and function. Synthetic additives like

antibiotics have been used over the years for this aim at sub therapeutic doses in broiler diets (Enerberg *et al.*, 2000). They act directly against pathogens in the gut creating a favourable environment for energy and protein digestion, absorption and metabolism (Puyalto and Mesia, 2002). Although these synthetic additives enhance growth performance in birds, the residual effect on meat products pose potential threat to human health discourages its use and has led to the ban by many countries of the world (Cardozo *et al.*, 2004). Therefore, the search and use of phytogenics as a replacement for synthetic additives suffices as a better alternative in improving bird's performance, meat quality, safety for humans and reduction in the cost of disease treatment (Hedayata *et al.*, 2013). Phytogenic feed additives include; herbs, spices and essential oils and varies depending on their origin and processing

method. Phytochemicals are plant derived compounds and have been found to be useful to man because of their nutritional and medicinal functions, and some are indigenous to Africa and have been reported to influence nutrient utilization by chickens (Denli *et al.*, 2003; Windisch *et al.*, 2007 and Tian, 2008). Phytochemicals are in form of rhizomes, bulbs, leaves, knots, fruits and seeds. Examples are *Ocimum gratissimum* L. (scent leaf), *Allium sativum* L. (garlic), *Zingiber Officinale Roscoe* (ginger), *Tetrapleura Tetraptera*, *Gongronema latifolium* and many others. These phytochemicals are known to enhance performance of broiler chickens (Carrizo *et al.*, 2005), improve feeds palatability through their flavour, promote digestibility and impact some medicinal function when consumed by man or livestock as part of their food (Tian, 2008). They also promote intestinal health, improve immune system response and possession of anti-inflammatory, antimicrobial and antioxidant properties (Jamroz *et al.*, 2003) and improve the utilization of digestive products (Igbal *et al.*, 2001; Greathead, 2003).

*Xylopiya aethiopiya* (Selim pepper) contains phytochemical compounds such as tannins, saponin, flavonoid, alkaloid, phenols and oxalate which are responsible for its varied biological and pharmacological activities. The fruit is also rich in minerals such as iron, calcium, magnesium, potassium and zinc.

This study was carried out to evaluate the nutritional quality of the fruit by assessing its effect as feed additive on the growth, carcass and organs characteristics of broilers chickens.

## Materials and Methods

### Experimental Site

The study was conducted at the poultry unit of the Teaching and Research farm of the Department of Animal Science, Akwa Ibom State University, Obio Akpa Campus. The area lies between Latitudes 5°17' and 5°27' North of the Equator and Longitudes 7°27' and 7°58' East with temperature ranging from 24 - 25°C, an average annual rainfall ranging from 3500 – 5000 mm and a relative humidity of between 60-90% (Comfort and Idorenyin, 2018; Wikipedia, 2022).

### Procurement and Processing of *Xylopiya aethiopiya*

The *Xylopiya aethiopiya* seeds were purchased from the local market in Abak, Akwa Ibom State. The seeds were washed free from debris and sundried for 7 days. The dried samples were ground into powder using a manual blender (Corona 1016, Landersy Y.CIA, South Africa) to produce *xylopiya aethiopiya*. The *Xylopiya aethiopiya* seed powder (XSP) was packaged and stored in a cellophane bag under room temperature till usage.

### Proximate Analysis of *Xylopiya aethiopiya*

Sample of ground *Xylopiya aethiopiya* seeds powder were subjected to proximate analysis for the determination of Crude Protein, Ether extracts, Crude Fibre and ash using the guide provided by AOAC (2005). While phytochemical analysis for Tannin, saponin, flavonoid, alkaloid, oxalate, polyphenol, hydrogen cyanide (HCN), were determined using standard methods (Harbone, 1973; Kirk and Suya, 1998; Bradbury *et al.*, 1999; AOAC, 2005).

### Experimental Diets

Five (5) experimental diets were formulated at starter and finisher phases. The diets were labelled T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, and T<sub>5</sub>. Treatment

one (T<sub>1</sub>) the control had no *Xylopi* *aethiopica* seed powder while T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub> had 100, 200, 300 and 400 g/100 kg feed. Ingredients and nutrient composition of the experimental broiler diets is presented in Tables 1 and 2.

#### Management of Experimental Birds and layout of the experiment.

A total of two hundred day old Abor-acre broiler chickens were purchased from reputable poultry distributor in Uyo, Akwa Ibom State. The house was washed, disinfected and left to air dry for one week before the arrival of day old chicks. Some hours before the arrival of the chicks, the pen was heated to provide enough warmth for the chicks. On arrival, the initial weights of the birds were taken before they were randomly allotted to five treatments (T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, and T<sub>5</sub>) with four replicates of 10 birds each in a completely randomized design. birds were housed in pens measuring 2 m by 2 m. The system of management was intensive using deep litter system. Wood shavings were used as litter materials instead of sawdust to prevent complications such as respiratory diseases. Feed and water were supplied to the birds' *ad libitum* throughout the experimental period. The birds were fed a starter diet from 0 – 4 weeks of age and finisher from 5 - 8 weeks (Tables 1 and 2). All routine medications and vaccines were administered as at when due. Strict sanitation practices were adopted (drinkers were washed daily and litter materials changed weekly). The experiment lasted for 56 days.

#### Data Collection

On arrival the birds were weighed using a sensitive balance (MODEL SF 400) to obtain their initial body weight and were weighed weekly thereafter. The weight gain was calculated by subtracting the initial weight from the final weight using a 20 kg capacity weighing balance (Hana Spring – platform scale). 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 (FCR) was calculated by dividing the daily feed intake by daily weight gain.

#### Carcass Characteristics and organs Evaluation

The carcass analysis was done according to methods of Scot *et al.* (1969). At the end of the experiment, four (4) birds were randomly selected from each replicate for carcass evaluation. The birds were starved overnight, weighed and slaughtered by severing the jugular vein and ~~and~~ to bleed thoroughly. Before defeathering, the carcass was scalded in hot water (70-75°C) for a minute and the feathers plucked manually. The carcasses were eviscerated and weighed to determine the carcass yield. The weights of the carcass, cut-up parts; breast, thigh, back, drumstick and wing were recorded individually and expressed as ~~part~~ of dressed weight of the broilers. The weight of the internal organs (gizzard, heart, kidney, and liver) were recorded and expressed as percentage of dressed weight of the broilers.

#### Data Analysis

Data collected from the various parameters measured were subjected to analysis of variance (ANOVA) using SAS (1999) software and significant means were separated using Duncan's multiple range tests (Duncan, 1955).

**Table 1: Gross Composition of Experimental Broiler Starter Diet**

Ingredients	T <sub>1</sub> (0gXSP)	T <sub>2</sub> (100gXSP)	T <sub>3</sub> (200gXSP)	T <sub>4</sub> (300gXSP)	T <sub>5</sub> (400gXSP)
Maize	50.00	50.00	50.00	50.00	50.00
Soya Bean Meal	25.00	25.00	25.00	25.00	25.00
Fish Meal	3.00	3.00	3.00	3.00	3.00
Wheat Offal	9.00	9.00	9.00	9.00	9.00
Palm Kernel Cake	8.00	8.00	8.00	8.00	8.00
Bone Meal	4.00	4.00	4.00	4.00	4.00
Common Salt	0.25	0.25	0.25	0.25	0.25
Mineral / Vitamin Premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>
<b>Calculated chemical Composition %DM</b>					
Crude Protein	22.92	22.92	22.92	22.92	22.92
Ether Extract	4.09	4.09	4.09	4.09	4.09
Crude Fibre	3.15	3.15	3.15	3.15	3.15
ASH	3.57	3.57	3.57	3.57	3.57
NFE	66.27	66.27	66.27	66.27	66.27
ME (MCH/kg)	2879.85	2879.85	2879.85	2879.85	2879.85

XSP = *Xylopiya aethiopica* Seed Powder; DM Dry Matter;

\*To Provide the following per kg of feed: Vitamin A, 10,000 IU; Vitamin D3, 2000 IU; Vitamin E, 12mg; Vitamin K, 2mg; Vitamin K, 2mg; Vitamin BI, 1.5mg; Vitamin B2, 4g; Vitamin B6, 1.5mg; Vitamin B12, 12mg; Niacin, 15mg; panthothenic acid, 5mg; folic acid, 5mg; Biotin, 2mg; choline chloride, 100mg; manganese, 75mg; Zinc, 5mg; Iron, 2 mg; Copper, 5mg; Iodine, 1.0mg; Selenium, 2.0mg; cobalt, 5mg; Anti-Oxidant, 125mg.

## Results and Discussion

The proximate composition of *Xylopiya aethiopica* seed powder is shown in Table 3. *Xylopiya aethiopica* had 15.23% crude protein, 9.07% crude fat, 7.83% crude fibre, 4.55% ash and 56.52% for Nitrogen free extract. The crude protein value recorded in this study was higher than the values reported by Yusuf *et al.* (2014), Okagu *et al.* (2018) and Onmeje *et al.*, (2020). While the crude fibre content was lower than the values obtained by the afore-mentioned authors. The crude fat and nitrogen free extract values were lower than values reported by Yusuf *et al.* (2014) but higher than those reported by Okagu *et al.* (2018). The content ash agreed with that reported by Okagu *et al.* (2018). The disparity in the proximate composition by the various researchers may suggest

different growth conditions and geographical variations in the level of soil fertility, efficiency of mineral uptake, stage at harvesting, climatic conditions, analytical procedure employed and time of evaluation (Ozcan, 2004; Agu *et al.* 2017). The phytochemical composition of *xylopiya aethiopica* is shown in Table 4. The phytochemical analysis showed that *xylopiya aethiopica* seed contained tannin (0.79 + 0.07%), saponin (1.23 + 0.07%), phytate (0.40 + 0.07%), oxalate (0.21 + 0.05%) and hydrogen cyanide (HCN) (5.77 + 0.00%). Significant differences ( $p < 0.05$ ) were observed across treatments for the final body and daily weight gain in the starter phase. T<sub>4</sub> recorded the highest significant ( $p < 0.05$ ) value for the two parameters followed by T<sub>5</sub>, T<sub>2</sub> and T<sub>1</sub>. The values for T<sub>4</sub> and T<sub>5</sub> were

statistically similar ( $p>0.05$ ), while  $T_3$  were significantly higher ( $p<0.05$ ) than  $T_2$  and  $T_1$ . This result indicates that *xylopia aethiopica* has growth promoting potentials.

This could suggest the presence of several compounds in the fruits (flavonoids saponins, tannins) which have biological activities which includes stimulation of digestive enzymes, saliva, hydrochloric acid and mucus; antioxidant effect and

antimicrobial activities according to Jang *et al.* (2004) and Sirinivasan (2007). This result is similar to the report of Ndelekwute and Enyenihi (2018) who reported a significant increase in the growth of starter broilers fed diet containing *xylopia aethiopica* seed. The result also agrees with the findings of Iskwenu and Udoma (2015) who reported improved growth performance of chickens administered different concentration of powdered *aethiopica* seeds in drinking water.

**Table 2: Ingredient Composition of Experimental Broiler Finisher Diet**

Ingredients	T <sub>1</sub> (0gXSP)	T <sub>2</sub> (100gXSP)	T <sub>3</sub> (200gXSP)	T <sub>4</sub> (300gXSP)	T <sub>5</sub> (400gXSP)
Maize	55.00	55.00	55.00	55.00	55.00
Soya Bean Meal	20.00	20.00	20.00	20.00	20.00
Fish Meal	3.00	3.00	3.00	3.00	3.00
Wheat Offal	9.00	9.00	9.00	9.00	9.00
Palm Kernel Cake	8.00	8.00	8.00	8.00	8.00
Bone Meal	4.00	4.00	4.00	4.00	4.00
Common Salt	0.25	0.25	0.25	0.25	0.25
Mineral / Vitamin Premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>
<b>Calculated chemical Composition % DM</b>					
Crude Protein	21.37	21.37	21.37	21.37	21.37
Ether Extract	4.32	4.32	4.32	4.32	4.32
Crude Fibre	3.96	3.96	3.96	3.96	3.96
ASH	5.25	5.25	5.25	5.25	5.25
NFE	65.10	65.10	65.10	65.10	65.10
ME (MCH/kg)	2911.02	2911.02	2911.02	2911.02	2911.02

\*XSP = *Xylopia aethiopica* Seed Powder; DM Dry Matter;

\*To Provide the following per kg of feed: Vitamin A, 10,000 IU; Vitamin D3, 2000 IU; Vitamin E, 12mg; Vitamin K, 2mg; Vitamin K, 2mg; Vitamin B1, 1.5mg; Vitamin B2, 4g; Vitamin B6, 1.5mg; Vitamin B12, 12mg; Niacin, 15mg; panthothenic acid, 5mg; folic acid; 5mg; Biotin, 2mg; choline chloride, 100mg; manganese, 75mg; Zinc, 5mg; Iron, 2 mg; Copper, 5mg; Iodine, 1.0mg; Selenium, 2.0mg; cobalt, 5mg; Anti-Oxidant, 125mg.

The feed intake of the birds in all treatments group in the starter phase was statistically similar ( $p>0.05$ ) but the values increased numerically as the level of *xylopia aethiopica* seed increases in the diet. This is in line with the observation of Essien (2021) who reported similar feed intake of starter broiler chicken fed

diet containing varying levels of *Tetrapleura tetraphera*. There were no significant ( $p>0.05$ ) differences on the feed conversion ratio of the starter birds across the treatments. T4 had the best and the lowest feed conversion ratio, this imply that the nutrients in the feed were effectively and efficiently utilized. The

result obtained for feed conversion ratio is in accordance with the report of Ekine *et al.* (2020) where birds fed the highest dietary level turmeric (1.0%) had the lowest and best ( $p < 0.05$ ) FCR value.

In the finisher phase, there were significant differences ( $p < 0.05$ ) in the final weight and daily weight gain of the broiler chickens. T<sub>4</sub> recorded the highest ( $p < 0.05$ ) value for the two parameters across treatment followed by T<sub>5</sub> which was significantly higher ( $p < 0.05$ ) than T<sub>3</sub> and T<sub>2</sub>. The values for T<sub>2</sub> and T<sub>1</sub> were similar, T<sub>3</sub> recorded a higher significant ( $p < 0.05$ ) final weight and average weight gain values than T<sub>2</sub> and T<sub>1</sub>. (Table 5).

The higher values observed for broiler chickens fed higher levels of the test material in the diet could be attributed to the beneficial effects of bioactive compounds present in *xylopi*a *aethi*opica seed which help to improve growth performance of birds by enhancing the secretions of endogenous digestive enzyme, creating favourable environment in the gut for digestion, absorption and effective utilization of nutrients (Okwu, 2003; Ingweye *et al.*, 2020). The results of this study are congruent with those of Odunowo and Olumide (2019), Ndelekwute and Enyenih (2018) and Essien (2021) who reported significant increase in final weight and daily weight gain of broiler chickens fed garlic, *xylopi*a *aethi*opica seed and *Tetrapleura tetra*ptera, respectively. However, it was observed in this study that broiler chickens fed 300 and 400 g/100 kg of feed of *xylopi*a *aethi*opica seed powder did not differ in their performance. This could suggest that if the spice level in the diet is above 0.40% it might lead to a reduction in growth performance, hence, *xylopi*a *aethi*opica seed seems to have an inclusion limit which when exceeded could have detrimental effect on the performance of broiler birds. The results obtained in this study

indicated that broilers can tolerate 0.0g–400g/100 kg feed of *xylopi*a *aethi*opica seed powder in their diet.

The feed intake of the broiler chickens in the finisher phase were statistically similar ( $p > 0.05$ ) in their values across treatment. The result followed the same trend as in the starter phase. The results obtained in this study could suggest that the diets were adequate in nutrients and also palatable. Diaz – Sanches *et al.* (2015) reported that palatability of feed could be seen as an important factor that influence voluntary feed intake in broilers. Phytochemicals have been reported to contain a cocktail of numerous bioactive substances which gives a specific flavour that stimulates the oronasal and gastro intestinal tracts thereby enhancing the intake of feed (Lee *et al.*, 2003; Brenes and Roura, 2010; Diaz-Sanchez *et al.*, 2015). The results of this study are in consonance with those of Duwa *et al.* (2019) who recorded no significant ( $p > 0.05$ ) difference in feed intake value of broiler chickens fed diets containing ginger.

The feed conversion ratio of the birds in the finisher phase were not significantly ( $p > 0.05$ ) affected rather the values were statistically similar. This result varies with those of Aji *et al.* (2011) and Mansoub (2012) where better feed conversion was obtained from broilers fed aqueous extract of garlic compared with the control. This result could suggest the efficacy of phytochemical on the performance of birds with regards to its appetite promoting effect and subsequent growth enhancement.

The results of the carcass characteristics indicated that significant differences ( $p < 0.05$ ) were observed for live weight and dressed weight of the broiler chickens among treatment. Birds in T<sub>4</sub> group recorded the highest ( $p < 0.05$ ) value for the two parameters. This result is in line with the findings of Odunowo and Olumide (2019) who reported significant variation in the value of birds fed diet containing garlic (*Allium sativum*). The results here could be attributed to the

relationship between dressed weight and weight gain where heavy birds produced greater dressed weight. The dressing percentage indicated non-significant ( $p>0.05$ ) differences in their values across treatment. However, the values obtained were higher than those (60.30 – 74.65%) reported for broiler chickens by Bamgbose and Niba (1998).

The primal cut-up parts (drumstick, thigh, breast-cut, back cut and wing) had no significant ( $p>0.05$ ) differences within or across treatments. The results obtained indicated numerical increase. The values increased numerically as the level of *xylopi* *aethiopia* seed in the diet increased. The non-significant variations obtained in this study on cut-up parts agree with the report of Onibi *et al.* (2009), where cut-up parts of broiler chickens fed ginger and garlic were not significantly affected by the diet. The results of the carcass and organs of the birds is presented in Table 6.

The results of the internal organs (liver, heart, gizzard and kidney) had no significant variations in their values across treatments. The values for liver and heart were similar with the values reported by Odunowo and Olumide (2019). However, the heart and liver values obtained in this study varies with those of Olumide and Akintola (2018) who recorded significant variations in liver and heart values of broiler chickens fed diet containing scent leaf (*Ocimum gratissimum*). The results indicated that *xylopi* *aethiopia* seed did not exert any negative influence on the organs.

#### Conclusion

Based on the results obtained in this study, inclusion of *xylopi* *aethiopia* seed powder at the rate of 400 g/100 kg of feed in broiler diets improved growth performance and had no detrimental effect on all the parameters measured.

**Table 3: Proximate Composition of *Xylopi aethiopia* Seed**

Parameters	Percentage (%)
Crude protein	15.23
Crude Fat	9.07
Crude Fibre	7.83
Ash	4.55
Nitrogen Free Extract (NFE)	56.52
Dry Matter	93.19
Gross Energy (kcal/g)	4.26

Solomon et al. 2022

**Table 4. Performance of Broiler starter chickens fed diets containing varying levels of *Xylopi* *aethiopia***

Parameter	T <sub>1</sub> 0 Control	T <sub>2</sub> 100g (XSP)	T <sub>3</sub> 200g (XSP)	T <sub>4</sub> 300g (XSP)	T <sub>5</sub> 400g (XSP)	SEM
Initial weight (g)	40.04	40.02	40.01	40.03	40.31	0.50
Final weight (g)	752.03 <sup>c</sup>	764.57 <sup>c</sup>	866.93 <sup>b</sup>	991.00 <sup>a</sup>	973.32 <sup>a</sup>	1.30
Weight gain (g)	711.99	724.55	826.92	950.97	933.01	1.31
Daily weight gain (g)	25.43 <sup>c</sup>	25.88 <sup>c</sup>	29.53 <sup>b</sup>	33.96 <sup>a</sup>	33.32 <sup>a</sup>	0.75
Feed intake (g)	53.62	54.47	54.83	54.94	54.99	0.16
FCR	2.11	2.10	1.86	1.61	1.65	0.10
Mortality %	0.00	0.00	0.00	0.00	0.00	0.00

\*SEM = Standard Error of Mean.

\*(abc) means along rows bearing different superscripts are significantly different (P<0.05)

\* XSP means *Xylopi* *Aethiopia* Seed Powder

**Table 5: Growth performance of broiler finisher chickens fed diets containing Varying levels of *Xylopi* *aethiopia***

Parameter	T <sub>1</sub> Control	T <sub>2</sub> (100g) (XSP)	T <sub>3</sub> (200g) (XSP)	T <sub>4</sub> (300g) (XSP)	T <sub>5</sub> (400g) (XSP)	SEM
Initial weight (g)	744.11	745.01	743.51	744.31	738.00	4.10
Final weight (g)	2354.31	2381.11	2497.01	2565.41	2543.95	2.04
Weight gain (g)	1610.02	1636.10	1753.50	1821.10 <sup>a</sup>	1805.95 <sup>b</sup>	1.80
Daily weight gain (g)	57.51	58.43	62.63 <sup>a</sup>	65.04 <sup>b</sup>	64.50 <sup>b</sup>	0.60
Feed intake (g)	129.40	130.18	130.11	132.13	133.11	0.30
FCR	2.25	2.23	2.08	2.03	2.06	0.02
Mortality %	0.00	0.00	0.00	0.00	0.00	0.00

\*(abc) means along rows bearing different superscripts are significantly different (P<0.05)

\*SEM = Standard Error of Mean.

\*FCR = Feed Conversion Ratio.

\* XSP means *Xylopi* *Aethiopia* Seed Powder

**Table 6: Carcass and organ characteristics of broiler chickens fed diets containing varying levels of *Xylopiya aethiopica***

Parameter	T <sub>1</sub> 0.00g (XSP)	T <sub>2</sub> 100g (XSP)	T <sub>3</sub> 200g (XSP)	T <sub>4</sub> 300g (XSP)	T <sub>5</sub> 400g (XSP)	SEM
Live weight (kg)	2.33 <sup>a</sup>	2.32 <sup>a</sup>	2.48 <sup>b</sup>	2.56 <sup>b</sup>	2.51 <sup>b</sup>	0.30
Dressed weight (kg)	2.03 <sup>b</sup>	2.02 <sup>b</sup>	2.18 <sup>a</sup>	2.26 <sup>a</sup>	2.21 <sup>a</sup>	0.30
Dressing %	87.12	87.07	87.90	88.28	88.04	0.80
<b>Cut Parts</b>						
Thigh (g)	210.03	207.51	215.41	231.23	228.11	0.22
Drumstick (g)	183.11	185.63	188.31	201.15	191.21	0.21
Breast cut (g)	383.13	387.81	411.11	427.31	421.52	0.40
Back cut (g)	211.46	218.92	227.43	231.51	230.61	0.20
Wing Cut (g)	120.43	125.51	131.34	132.11	131.68	0.11
<b>Internal Organs %</b>						
Gizzard (g)	2.16	2.13	2.14	2.13	2.16	0.02
Kidney (g)	0.71	0.74	0.67	0.71	0.74	0.01
Liver (g)	1.65	1.67	1.65	1.71	1.74	0.01
Heart (g)	0.47	0.50	0.45	0.51	0.48	0.04

<sup>a</sup>(ab) = means along rows bearing different superscripts are significantly different(P<0.05)

\*SEM = Standard error of mean

\* XSP means *Xylopiya Aethiopica* Seed Powder

## References

- Agu, E. C. Okeudo, N. J. Aladi, N. O. and Okoro, V. M. O. (2017). Effect of dietary inclusion of ginger meal on performance serum cholesterol profile and carcass quality of broilers. *Nigerian Journal of animal Production* 44(1):254 – 266.
- Aji, S. B., Ignatius, K., Ado, A. Y., Nuhu, J. B. and Abdulkarin, A. (2011). Effect of Feeding Onion (*Allium cepa*) and Garlic (*Allium sativum*) on some performance characteristics of broiler chickens, *Research Journal of Poultry Sciences* 4:22-27.
- AOAC (1995), Official method of Analysis 15<sup>th</sup> Edition, Association of Official Analytical Chemists (AOAC). Washington DC, USA.
- Bamgbose A.M. and Niba, A.T. (1998). The Nigerian Livestock industry in the 21<sup>st</sup> Century 3<sup>rd</sup> Annual Conference of Animal Science Association of Nigeria (ASAN) pg. 84-87.
- Berezin, V. E., Bogoyav lenskyi, A. P., Khudiakova, S. S., Alexuk, P. G., Omirtaeva, E. S., ZAITCEVA, I. A. Tustikbaeva, G. B., Barfield, R. C. and Fetterer, R. H. (2010).

### Solomon et al. 2022

- Immunostimulatory complexes containing *Ermeria tenella* antigens and low toxicity plant saponins induce antibody response and provide protection from challenge in broiler chickens. *Veterinary parasitology* 167(1):28-35.
- Bradbury M.G. Eugen, S. V. and Bradbury, J. H. (1999). Determination of all Forms of Cynaogens in Cassava Roots and Cassava Products Using Picrate Paper Kits. *Journal of Sciences, Food and Agriculture* 79:593-601.
- Brenes, A., and E. Roura. (2010). Essential oils in poultry nutrition; main effects and modes of actions. *Animal Feed Science Technol.* 158:1-14.
- Cardozo, P. W., Calsamiglia, S., Ferret, A. and Kamel, C. (2004). Effects of natural plant extracts on ruminant protein degradation and fermentation profiles in continuous culture. *Journal of Animal Science* 82(11):3230 -3236.
- Carrijo, A.S., Madeira, L.A., Sartori, J. K., Pezzato, A. C., Goncalves, Cruz, V.C. (2005). Powdered garlic in the alternative feeding of broiler chickens. *Brazilian J. Agric Science* 40(7):673-679.
- Denli, M, Okan, F. and Celik, K. (2003), Effect of dietary probiotic, organic acid and antibiotic supplementation to diets on broiler performance and carcass yield. *Pakistan Journal of Nutrition* 2 (2):89 – 91.
- Diaz-Sanches S., D' Souza D., Biswas, D. and Hanning, I. (2015). Botanical alternatives to antibiotics for use in organic poultry production. *Poult Sc.* 94(6): 1419 – 30, doi:10.3382/ps/pev014.
- Duncan, D. B. (1955) Multiple range and Multiple F-Test. *Biometrics* 11:1-42.
- Duwa, H., Saleh, B., Chana, Z. M. and Girgini A. Y. (2019). Influence of varying dietary energy levels supplemented with ginger or probiotics on performance of broiler chickens under a semi-arid environment. *Nigerian Journal of Animal Science* 21(1):56-62.
- Egbewande, O.O., Ibrahim, H. G. Idris, Y. and Kabiril, S. (2021). Effect of garlic (*Allium Sativum*), ginger (*Zingiber officinale*) and their combination on the performance of broiler birds. Nigerian society for animal production (NSAP) 46<sup>th</sup> Annual Conference – Dutsinma 2021 Book of proceedings pp 74 – 77.
- Ekine, O. A., Udoudo, E. F. and George, O. S. (2020). Influence of turmeric (*Curcuma longa*) as feed additives on the performance, serum enzymes and lipid profile of broiler cickens. *Nigerian Journal of Animal Science*, 22 (2):57-63.
- Enerbery, R.M. Hedermann, M.S., Lasser, T.D. and Jenson, B.B. (2000). Effect of Zinc Bacteracin and salinomycin on intestinal microflora and performance of broilers. *Poult Sci.* 99: 1311-1319.
- Essien, C. A. (2021). Effects of Tetrapleura Tetraptera on performance, carcass characteristics and organ indices of broiler chickens. *Animal Research International* 18(2): 4134 – 4144.
- Essien, C. A. and Sam I M. (2015). Nutritional evaluation of Icacinia manni (Earth Ball) processed in saline as a source of dietary energy in broiler production. *Journal of Biology, Agriculture and Healthcare* 8(2) 19-23.
- Greathead, H. (2003), Plants and plant extracts for improving animal productivity proceedings of the Nutrition society, 62(2):279-290.
- Hedayati, M; Manafi, M; Yari, M. and Vafaei, P. (2013). Effects of Supplementing diets with Acidifier on performance parameters and visceral organ weights of broilers. *European Journal of Zoological Research* 2:49-55.
- Ingweye, J. N., Kalio, G. A and Thomas, S. (2021). Influence of dietary

- supplementation of aidan (*Tetrapleura tetraptera*) and or turmeric (*curcuma longa*) on performance and bio-economics of broiler chickens. 46<sup>th</sup> Annual conference – Book of Proceedings NSAP 46:276-280.
- Isikwenu, J. O and Udomah, J. E. (2015). Effects of xylopia aethiopia dried fruits (grain of selim) as additive on performance, carcass characteristics and economics prospects in finisher broilers. *Journal of Agriculture and Veterinary Science* 8(3):07-12.
- Isikwenu, J. O. (2015). Nutrient digestibility and growth performance of finisher broilers given dried *Xylopia aethiopica* fruits (Grains of selim) as additives. *American Journal of Experimental Agriculture* 8(5):320-326.
- Iqbal, Z., Nadeem, Q. K., Khan, M. N., Akhtar, M. S. and Waraich, F. N. (2001). *In vitro* anthelmintic activity of *Allium sativum*, *Zingiber officinale*, *Curcubita Mexicana* and *Ficus religiosa*. *International Journal of Agriculture and Biology*, 3(4): 454-457.
- Jamroz, D. and Kamel, C. (2002). Plant extracts enhance broiler performance. *Journal of Animal Science*, 80:41- 48.
- Jang IS, KO YH, Yang HY, Ha JS, Kim, JY, Kang SY, Yoo DH, Nam DS, Kimand DH and Lee CY (2004). Influence of essential oil components on growth performance and the functional activity of the pancreas and small intestine in broiler chickens. *Asian – Aust., J. Anim. Sci.* 17:394-400.
- Lee, K.W. Everts, H., Kappert, H. J., Losa R., and Beynen, A. G. (2003). Dietary carvicol lowers body weight gain but improves feed conversion in female broiler chickens. *Journal of Applied Poultry Research*, 12:394-399.
- Mansoub, N. H. (2011). Comparison of effects of using thyme and probiotic on performance and serum composition of broiler chickens. *Advances in Environmental Biology*, 5:2012-2015.
- N., H., Martinez, Y., Guan, G., Rodriguez, R., Mas. D., Peng, H. Valdivie Navarro, M. and Liu, G. (2016). Analysis of the impact of isoquinoline alkaloids, derived from *macleaya cordata* extract, on the development and innate immune response in swine and poultry. *Biomed Research International*, 2016: 1352146, <http://doi.org/10.1155/2016/1352146>.
- Ndelekwute, E. B., E. K., Etuk, I. F., Ogbuewu, I. P. and Kadurumba, O. E. (2012). Performance of Broiler chickens fed *ocimum gratissimum* L. Supplemented Diets. Proc. 6<sup>th</sup> Ann. Conf. Nig. Soc. For Indigenous Knowledge and Devpt. (NSIKAD). June 5<sup>th</sup> – 7<sup>th</sup> MOUA, Umudike, Pp. 15-16.
- Ndelekwute, E. k. and Enyenilni, G. E (2018). Negro pepper (*Xylopia aethiopica*) in feed as Antibacterial and can improve broiler chicken productivity. *British Journal of Poultry Sciences* 7(1) 10-15.
- Odunowo, O. O. and Oluumide, M. D. (2019). Growth response and carcass characteristics of broiler chickens fed diets supplemented with garlic (*Allium Sativum*). *Nigerian Journal of Animal Science*, 21 (1): 163 – 171.
- Okagu, I. U., Ogugua, V. N., Dabor, C. N., Ifeanacho, M. U., Nnebe, M. E., Aniehe, C. C., Odenigbo, C. J. and Ngwu, U. E. (2018). Effects of Methanol Extraction on some Nutritional and Antinutrient Contents of *Xylopia aethiopica* Fruits from Enugu State, Nigeria. *Asian Journal of Agriculture and Food Sciences*, Vol. 6(3): 84 – 96.
- Okwu, D. E. (2003). The potentials of *Ocimum gratissimum*, *Pengularia extensa* and *Tetrapleura tetraptera* as spice and flavouring agents. *Nigeria Agricultural Journal*, 34:143-148.
- Oluyemi, J. A. and Roberts, F.A. (2000) *Poultry Production in Warm Wet Climate*. 2<sup>nd</sup> ed.

Commented [N1]: Follow journal format

**Solomon et al. 2022**

- Spectrum Books Ltd. Ibadan, Nigeria. Pp. 210.
- Onibi, G. E., Adebisi, O. E. and FAJE MIsin A. N. (2009). Response of broiler chickens in terms of performance and meat quality to garlic (*Allium sativum*) supplementation. *African Journal of agricultural Research*, 4(5): 511-517
- Ozcan, M. (2004). Mineral contents of some plants used as condiments in Turkey. *Food chemistry* 84:437-440.
- Perin, G., Baldissera, M. D., Fernandes, M., Barreta, M., Casagrande, R. A., Griss, L. G., Fortuoso, B. F., Volpato, A., Stefani, L. M., Boiago, M. M. and De Cristo, T. G. (2019). Effects of tannin-containing diets on performance, gut disease control and health in broiler chicks. *Animal Production Science* 59(10): 1847-1857.
- Puyalto, M. and Mesia, J. 2002. Fighting Gut Pathogens. In-Vitro Assessment of Organic Acids Derivatives and Combinations. *Poult Intl. Aug.* 41(2): 19-24.
- Sirinivasan, K. (2007). Black pepper and its pungent principle – piperine. A review of diverse physiological effects. *Food Science and Nutrition* 47(8):735 – 748.
- Tian, W. 2008. Herbs in Africa. A Field guide to the natural history of herbs NSW Department of primary industries. <http://www.wiseject.com/herbs>.
- Udofia, U.S., and Alozie, Y. E. (2015). Nutrients and Phytochemical composition of spices in relation to health (“Uyayak” (*Tetrapieura tetraptera*), “Inwun” (*Monodora myristica*, “Odusa” (*piper guineense*), and “Ata” (*Xylopi aethiopica*). *Nigerian Journal of Agriculture, Food and Environment* 11(2):211-214.
- Wikipedia (2020). Akwa Ibom State. Wikipedia.[http://www.wikipedia.org/wiki/Akwa\\_Ibom-state](http://www.wikipedia.org/wiki/Akwa_Ibom-state) Accessed December 4, 2020.
- Windisch, W, Schedle, K., Plitzner, C., and Kroismayr, A. (2007), Use of Phytogenic Products as Feed additives for swine and poultry. *J. Anim. Sc.* 86 (E. suppl.): E 140 – E 148.
- Zafar, F., Idress, M. and Ahmed, Z. (2005). Use of apple by-products in poultry rations in broiler chicks. *Pakistan Journal of Physiology* 1:1-2.