



Influence of Yohimbe on the carcass traits, chemical and sensory properties of broiler chickens meat

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ABSTRACT

Plant-based additives can improve meat quality attributes. The present study evaluated the influence of Yohimbe on carcass, chemical and sensory properties. A total of twenty-four live birds 56 days old, were selected from 30 Arbor acres chickens fed with either basal diet or basal diet + Yohimbe (240, 300 or 360 mg/Kg) supplements. The selected chickens were divided into four treatment groups with 6 birds each. Result showed that relative weights of bled, dressed, drumstick, breast and wings were not affected ($p>0.05$). However, eviscerated, thigh, ileum and jejunum weights were increased ($p<0.05$) with 360mg/Kg Yohimbe supplement, but plucked, heart, and liver weights were reduced ($p<0.05$) in chickens fed 300 mg/Kg Yohimbe supplement. Also, proximate composition revealed that meat fat content was reduced ($p<0.05$) at 360 mg/Kg Yohimbe fed chickens, and carbohydrate at 240 mg/Kg Yohimbe supplementation. Juiciness, meaty flavor, tenderness, and overall acceptability were also enhanced with 360 mg/Kg Yohimbe supplementation. Malondialdehyde (MDA), VLDL, and LDL were reduced ($p<0.05$) at 300 and 360 mg/Kg Yohimbe supplementation, while HDL was increased ($p<0.05$) at 300 and 360 mg/Kg. It may be therefore, concluded that supplementation of Yohimbe at 360 mg/Kg enhanced carcass traits and sensory scores of broiler chickens.

Keyword: Carcass yield, Lipid profile, Organoleptic, Proximate, *Pausinystalia yohimbe*

Use of nutritional supplements has a considerable impact on the welfare of animals as well as enhances meat, milk, and egg quality and yield. Specifically, meat's physical characteristics including color, water-holding capacity, and cooking losses, with chemical attributes like protein and cholesterol levels are subject to alteration through feeding interventions (Hoa *et al.* 2025; Aprianto *et al.* 2023). Of all the additives, plant-derived products have attracted particular interest. Plant sources such as *Alchemilla vulgaris*, *Hibiscus sabdariffa*, *Ficus tonningii*,

Moringa oleifera, *Allium sativum*, and *Zingiber officinale* have had appreciable effects on animals' internal organs (Mukonowenzou *et al.* 2021; Otulaja and Afolabi, 2022; Oghenochuko, and Mshelbwala, 2024). Apart from this, consumers' acceptance of meat product is influenced by color and texture. Meat quality attributes, such as color, flavor, juiciness, tenderness, pH, drip loss, and oxidative stability, can be just as altered by the introduction of plant sourced feed additives (Panea *et al.* 2019; Jaworska *et al.* 2021).

Pausinystalia yohimbe is a tropical tree that boasts diverse health benefits and has been utilized as a blood tonic, aphrodisiac, antidiuretic, and for its lipolytic effect. Previous researches on broiler chickens have demonstrated that yohimbe has no negative effects on abdominal organs (Otulaja and Afolabi, 2022), while sensory quality studies have revealed increased juiciness, meaty flavor, and overall acceptability (Obajuluwa *et al.* 2021). Metin and Ahmet (2016) also reported that yohimbe extracts induced protein accretion in broilers chickens. The active ingredient in yohimbe is yohimbine, an indole alkaloid. Some mechanism of yohimbine activities include: antagonism of α -adrenoreceptor and increase in catecholamine release (Golberg *et al.* 1983) and lipolysis (Barlan *et al.* 1991).

Despite these documented quality enhancement in meat quality attributes, optimum inclusion levels were

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undecided. This research, therefore, attempted to define the optimal amount of yohimbe bark powder supplementation to chicken diets for a better meat quality.

MATERIALS AND METHODS

Ethical approval: This experiment was approved by the Research Ethics Committee of the Department of Animal Production and Health, Federal University of Agriculture Abeokuta, Nigeria.

Experimental birds: A total of 24 Arbor acres day old chicks (commercial broiler chicken strain) were purchased from a commercial hatchery and managed for 56 days. During this period, birds were housed in a floor pen, and brooded for 14 days before they were assigned to 12 experimental units, with 2 birds per unit with an average weight of 221.10g/bird. Three (3) experimental units were randomly assigned to each experimental group. Birds in each experimental group were served their respective experimental diets. Temperature and lighting regime specified by Gerry, (2007) was followed during the experiment.

Processing of test ingredient: The test ingredient (*Pausinystalia yohimbe* bark) was purchased from a commercial market at Abeokuta after which it was cleaned and air dried until a constant weight was achieved. The dried bark was pulverized and sieved using metal sieve (size 0.3

cm). Alkaloid concentration of 1.88% was recorded in the *P. yohimbe* bark powder using the procedures by Harborne (1973).

Feeding: Chickens from each treatment groups were served diets with the composition listed in Table 1 and 2 below.

Carcass evaluation: At the end of experiment birds were slaughtered by neck slit and allowed to bleed for 2 minutes. After bleeding, the bled carcass was weighed to measure the bled weight. Afterwards, slaughtered chicken was scalded in hot water at temperature of 65°C and the feathers were plucked. The plucked carcass was weighed to measure the plucked weight. Visceral organs were removed and the head plus the shank cut off. The remaining carcass was weighed to determine the dressed weight.

Weights of cut parts which included: head, shanks, thigh, breast, neck, back, wings and drumsticks were taken. Furthermore, the weights of visceral organ: heart, lungs, liver, spleen, kidney, gizzard, intestine and caecum were also taken.

Finally, the abdominal fat yield was determined using the Cahaner *et al.* (1985) method. Also, weights of parts measured were expressed as percentages of the live weight.

Meat pH: An approximate mass of 10g was excised from the breast muscle of the carcass and the pH were taken using the procedure mentioned by Kim *et al.* (2008).

Table 1. Gross composition of the experimental diets at starter phase

Ingredients	Control	240mg/kg Yohimbe	300mg/kg Yohimbe	360mg/kg Yohimbe
Maize	52.50	52.50	52.50	52.50
Wheat bran	4.10	4.10	4.10	4.10
Soybean meal	18.50	18.50	18.50	18.50
Groundnut cake	16.50	16.50	16.50	16.50
Fish meal	2.50	2.50	2.50	2.50
Bone meal	3.00	3.00	3.00	3.00
Limestone	2.00	2.00	2.00	2.00
Salt (NaCl)	0.25	0.25	0.25	0.25
Vit/Min Premix	0.25	0.25	0.25	0.25
Methionine	0.20	0.20	0.20	0.20
Lysine	0.20	0.20	0.20	0.20
Total	100.00	100.00	100.00	100.00
Yohimbe (%)	-	0.24	0.30	0.36
Determined analysis (%)				
Crude Protein	20.81	26.92	24.56	26.92
Ether Extract	8.26	5.72	5.85	5.93
Crude Fibre	3.25	5.68	5.39	2.91
Ash	1.25	3.47	3.25	3.47
NFE	45.21	47.04	49.3	50.06
Determined True Metabolizable Energy (Kcal/Kg)	3282.343	2957.651	3315.551	2973.772

*Premix composition per kg diet: Vit A: 400,000.00 IU, Vit D3: 800,000.00 IU, Vit E: 9,200.00mg, Vit k: 800.00mg, Vit B1: 1000.00mg, Vit B6: 500.00mg, Vit B12: 25.00mg, Niacin: 6000.00mg, Pantothenic acid: 2000.00mg, Folic acid: 200.00mg, Biotin: 8mg, Mn: 300,000.00g, Zn: 20,000.00g, Cobalt: 80.00mg, I: 40.00mg, Choline: 80,000.00g, Antioxidants: 800.00mg

Table 2. Gross composition of the experimental diets at finisher phase

Ingredients	Control	240mg/kg Yohimbe	300mg/kg Yohimbe	360mg/kg Yohimbe
Maize	55.00	55.00	55.00	55.00
Wheat bran	9.10	9.10	9.10	9.10
Soybean meal	14.00	14.00	14.00	14.00
Groundnut cake	15.00	15.00	15.00	15.00
Fish meal	1.00	1.00	1.00	1.00
Bone meal	3.00	3.00	3.00	3.00
Limestone	2.00	2.00	2.00	2.00
Salt (NaCl)	0.25	0.25	0.25	0.25
Vit/Min Premix	0.25	0.25	0.25	0.25
Methionine	0.20	0.20	0.20	0.20
Lysine	0.20	0.20	0.20	0.20
Total	100.00	100.00	100.00	100.00
Yohimbe (%)	-	0.24	0.30	0.36
Determined analysis (%)				
Crude Protein	18.64	16.72	16.98	18.84
Ether Extract	6.81	4.68	4.82	5.12
Crude Fibre	4.67	4.45	5.31	5.97
Ash	2.84	3.16	3.21	3.45
NFE	51.61	55.67	54.65	53.24
Determined True Metabolizable Energy (Kcal/Kg)	3082.085	3005.050	2684.042	2518.431

*Premix composition per kg diet: Vit A: 400,000.00 IU, Vit D3: 800,000.00 IU, Vit E: 9,200.00mg, Vit k: 800.00mg, Vit B1: 1000.00mg, Vit B6: 500.00mg, Vit B12: 25.00mg, Niacin: 6000.00mg, Pantothenic acid: 2000.00mg, Folic acid: 200.00mg, Biotin: 8mg, Mn: 300,000.00g, Zn: 20,000.00g, Cobalt: 80.00mg, I: 40.00mg, Choline: 80,000.00g, Antioxidants: 800.00mg

Meat lipid profile determination: A piece of chicken breast was triturated with a known volume of chloroform and 1:1 (v/v) of methanol. The filtrate was allowed to stand for 5 minutes, after which non-lipid materials were decanted. A 2% (0.32M) W/V KCl solution was added and the filtrate was centrifuged followed by decanting of lipid. The lipid content was then made up to a final volume by adding chloroform. For the purification of lipid, method prescribed by Folch *et al.* (1957) was followed. The decanted lipid mixture obtained was used for the determination of cholesterol, triglyceride, high and low density lipoprotein using commercial kits by Randox laboratories.

Meat proximate determination: A 10g sample from the chickens breast was taken from carcass of each replicate, to determine the proximate composition (moisture, crude protein (CP), ether extract (EE), carbohydrate and ash content) using methods outlined by AOAC (2005). Values are expressed in percentage weights of wet samples.

Meat sensory analysis: Chicken breast samples, heat-treated to a controlled internal temperature of 70°C for 30 minutes in a water bath, underwent immediate post-cooking sensory analysis. To ensure consistent cooking and prevent moisture uptake, samples were vacuum-sealed in nylon bags. A panel of ten trained individuals assessed the cooked chicken. The panel underwent a 3-day training session to align on the sensory definitions of juiciness, tenderness, and

meaty flavor based on international standards (ISO 8586). Before evaluation of the cooked meat, the samples were assigned identification codes after the random re-shuffle.

The evaluation encompassed both visual and masticatory assessments, focusing on key sensory attributes: color, flavor, texture, juiciness, and tenderness. Panelists utilized a 9-point hedonic scale, ranging from 'like extremely' to 'dislike extremely,' to quantify their perceptions. The codified scale goes thus: 9 = like extremely, 8 = like very much, 7 = like moderately, 6 = like slightly, 5 = neither like nor dislike, 4 = dislike slightly, 3 = dislike moderately, 2 = dislike very much and 1 = dislike extremely. To mitigate residual flavor impact between samples, panelists were provided with water for oral rinsing. This methodology adhered to established sensory evaluation practices, as cited by Sanwo *et al.* (2011).

Data analysis: Data means were compared using the One Way Analysis of Variance (ANOVA). Before analysis, test for homogeneity was conducted using the Levene's test. Means were separated by Duncan Multiple Range Test (DMRT) at 5% level of significance using SAS version 9.2 (2010).

$$Y_{ij} = \mu + T_i + \epsilon_{ij}$$

Where:

Y_{ij} - Observed value of the dependent variable

Table 3. Effect of increased inclusion of *P. yohimbe* on the carcass characteristics of broiler chickens

Parameter	Control	Concentration of Yohimbe (mg/kg)			SEM	P-value
		240	300	360		
Live weight (g)	2021.67	1998.33	2224.00	1950.67	47.966	0.190
Bled weight (%)	97.44	96.90	96.67	96.31	0.233	0.419
Plucked weight (%)	93.71	92.50	91.70	91.58	0.386	0.179
Eviscerated weight (%)	75.64 ^{ab}	71.09 ^b	73.98 ^{ab}	86.58 ^a	2.447	0.101
Dressed weight (%)	65.75	60.48	63.94	69.48	1.761	0.372
Cut parts						
Thigh (%)	10.10	10.48	8.95	11.59	0.456	0.246
Drumstick (%)	10.07	9.77	8.66	10.72	0.405	0.375
Back (%)	16.84	10.55	13.41	16.85	1.283	0.253
Breast (%)	13.65	8.68	7.66	9.43	1.132	0.537
Wings (%)	8.54	8.68	7.66	9.43	0.348	0.398
Organs and offal						
Heart (%)	0.53 ^a	0.43 ^{ab}	0.35 ^b	0.47 ^{ab}	0.026	0.091
Spleen (%)	0.13	0.14	0.12	0.14	0.009	0.876
Kidney (%)	0.57	0.75	0.56	0.53	0.058	0.605
Liver (%)	2.91 ^a	2.02 ^c	2.25 ^{bc}	2.79 ^{ab}	0.139	0.033
Crop (%)	1.52	1.22	1.24	2.06	0.244	0.661
Proventriculus (%)	0.63 ^{ab}	0.54 ^b	0.49 ^b	0.81 ^a	0.043	0.022
Pancreas (%)	0.26	0.28	0.17	0.26	0.020	0.243
Gizzard (%)	4.08 ^{ab}	3.64 ^{ab}	3.27 ^b	4.90 ^a	0.243	0.070
Duodenum (%)	1.46	1.12	1.05	1.13	0.075	0.237
Ileum + Jejunum (%)	3.02 ^{ab}	3.56 ^{ab}	2.33 ^b	4.58 ^a	0.365	0.160
Caecum (%)	1.83	2.02	1.45	1.86	0.108	0.308
Duodenum length (cm)	24.26	36.80	41.43	31.57	2.979	0.207
Ileum + jejunum (cm)	105.40 ^b	113.40 ^{ab}	118.66 ^{ab}	135.60 ^a	4.534	0.086
Gizzard width (cm)	4.30	4.36	4.76	4.63	0.158	0.752
Gizzard length (cm)	5.23 ^{ab}	5.16 ^{ab}	4.76 ^b	5.46 ^a	0.103	0.087
Others						
Abdominal fat (%)	0.73 ^a	0.24 ^b	0.60 ^a	0.48 ^{ab}	0.070	0.049

^{a,b,c} Means on the same row with different superscripts differ significantly (P<0.05)

SEM = Standard Error of Mean

μ - Population mean

T_i - Effects of graded levels of Yohimbe (0, 240mg/kg, 300mg/kg and 360mg/kg)

ϵ_{ij} - Random residual error

RESULTS AND DISCUSSION

The influence of administered supplements is evident on some cut parts and meat quality parameters (Table 3). While the sample size (n = 6 representative birds per treatment) serves as a preliminary evaluation of *P. yohimbe*'s effects on meat quality, future large-scale studies are warranted to validate these physiological and sensory trends across larger commercial cohorts. The parameters measured on the carcass showed that Yohimbe has no detrimental influence on the key carcass traits, as the live

weight, bled weight, dress weight, and major cut parts were not negatively affected. Consumer preferences are usually based on the physical attributes of livestock among which are live weight and dressed weights (Liu *et al.* 2022). This implied that Yohimbe does not negatively affect the marketability of chicken carcass, as the key parameters are not negatively influenced. Although the plucked weights were reduced with the inclusion of Yohimbe at 360mg, this could be useful to agro-based industries which uses feather as a raw material. Altogether, aside from the plucked weight that was reduced, all other carcass trait indices were not negatively impacted.

Furthermore, the thigh weight, which is a cut part sold in the market, was improved with Yohimbe inclusion (Table 3). The thigh is a muscular part that is actively used for

Table 4. Effect of increased inclusion of *P. yohimbe* on pH and proximate composition of broiler chicken meat

Parameter	Control	Concentration of Yohimbe (mg/kg)			SEM	P-value
		240	300	360		
pH	5.36	5.46	5.33	5.50	0.036	0.352
Moisture content (%)	73.41	76.83	75.70	76.20	0.719	0.404
Fat content (%)	1.53 ^a	1.36 ^b	1.42 ^b	1.16 ^c	0.042	0.000
Ash (%)	2.97 ^a	2.71 ^b	2.79 ^{ab}	2.75 ^b	0.037	0.044
Crude Fibre (%)	0.57 ^a	0.52 ^b	0.58 ^a	0.56 ^a	0.008	0.014
Crude protein (%)	17.06 ^a	15.68 ^b	16.27 ^{ab}	15.86 ^b	0.208	0.055
Carbohydrate (%)	4.00 ^a	3.21 ^c	3.55 ^b	3.27 ^c	0.099	0.000

^{a,b,c} Means on the same row with different superscripts differ significantly (P<0.05)

SEM = Standard Error of Mean

Table 5. Effect of increased inclusion of *P. yohimbe* on sensory attributes of broiler chickens

Parameter	Control	Concentration of Yohimbe (mg/kg)			SEM	P-value
		240	300	360		
Colour	5.70 ^b	6.76 ^a	5.76 ^b	7.06 ^a	0.134	0.000
Juiciness	5.25 ^b	6.60 ^a	5.96 ^{ab}	6.66 ^a	0.146	0.001
Meaty Flavour	5.00 ^b	6.50 ^a	6.23 ^a	6.90 ^a	0.143	0.000
Tenderness	5.75 ^b	6.76 ^a	6.16 ^{ab}	6.46 ^{ab}	0.143	0.135
Saltiness	4.65 ^{ab}	4.86 ^a	5.30 ^a	4.00 ^b	0.113	0.002
Overall flavour	5.95 ^b	6.26 ^{ab}	6.10 ^{ab}	6.83 ^a	0.120	0.122
Overall acceptability	5.45 ^c	7.03 ^{ab}	6.50 ^b	7.46 ^a	0.116	0.000

^{a,b} Means on the same row with different superscripts differ significantly (P<0.05)

SEM = Standard Error of Mean

locomotion, support of body weight, and several physical activities. Metin and Ahmet, (2016) mentioned protein accretion in muscles of chickens served yohimbine in their water. Also, improvement in ileum and jejunum weight and length with Yohimbe inclusion at 360 mg/Kg suggest that the supplement improved gut development (Polidoro *et al.* 2025). The increase in intestinal length and weight suggested a potential for improved gut absorptive surface area (Zhao *et al.* 2024), however, histological analysis of villus height and crypt depth is required to confirm actual nutrient absorption efficiency.

Yohimbe does not influence the meat pH, ash, crude fiber, and crude protein of the analyzed samples (Table 4). These properties contribute to the nutritional and processing value of meat. The herbal additive preserved these qualities meat in samples and did not affect them negatively. However, the lipid content of broiler chickens were reduced with the administration of Yohimbe. As consumers prefer lean meat, the reduction of lipid content is a desirable outcome. The reduction could be due to the lipolytic properties of Yohimbe as Galitzky *et al.* (1988) reported that yohimbe extracts induced an increase in blood lipid through the mobilization of stored fat. Also, the carbohydrate present in meat excised from chickens fed Yohimbe were reduced. This could be related to pre-slaughter handling, as there were no records of glucose reduction linked to the consumption of Yohimbe.

Supplementation of chicken diet with Yohimbe resulted in the improvement of some sensory parameters (Table 5) such as color, juiciness, meaty flavor, tenderness, overall flavor and acceptability. This implied that yohimbe do improve meat sensory qualities. The improvement in color could be explained from the results of proximate composition. There was a reduction in carbohydrate content. Sugars as an example of carbohydrate contribute to meat color as they alter the appearance during heat treatment (Nasir *et al.* 2017). Juiciness and Tenderness contribute to the eating quality of the meat. Juiciness and Tenderness is an interplay between the fat, fiber and moisture content of meat (Roy and Bruce, 2024). Although pH influences the water holding capacity of meat, there were no variations in pH across the treatment groups. Therefore, the improvement in juiciness could be attributed to altered moisture and fiber content. In addition, meaty flavor was improved among treatments with Yohimbe supplementation. Meaty flavor is the taste of umami which results from the presence of glutamate in meat samples. Glutamate, being an amino acid could be released during the cooking process.

Furthermore, there was less lipid oxidation (Table 6) in meat from chickens fed diet supplemented with Yohimbe. This is observed as malondialdehyde (MDA) levels were lower in meat excised from the chickens. It implied there is improved oxidative stability as well as protection against

Table 6. Effect of increased inclusion of *P. yohimbe* on MDA and lipid profile of broiler chicken meat

Parameter	Control	Concentration of Yohimbe (mg/kg)			SEM	P-value
		240	300	360		
MDA (U/L X 10 ⁻⁹)	3.54 ^a	3.76 ^a	3.12 ^b	3.29 ^b	0.078	0.001
Total Cholesterol (mg/dl)	65.69 ^a	33.31 ^d	39.93 ^c	50.69 ^b	3.715	0.000
Triglyceride (mg/dl)	156.77 ^a	101.63 ^c	76.45 ^d	133.50 ^b	9.272	0.000
HDL (mg/dl)	10.16 ^c	10.33 ^c	12.54 ^a	11.40 ^b	0.299	0.000
LDL (mg/dl)	24.31 ^a	2.70 ^d	12.14 ^b	12.60 ^b	2.315	0.000
VLDL (mg/dl)	31.39 ^a	20.36 ^c	15.25 ^d	26.70 ^b	1.860	0.000

^{a,b,c,d,e} Means on the same row with different superscripts differ significantly (P<0.05)

SEM = Standard Error of Mean

MDA = Malondialdehyde

HDL = High Density Lipoprotein

LDL = Low Density Lipoprotein

VLDL = Very Low Density Lipoprotein

potential development of rancidity (Dragoev, 2024). The reduction of MDA could be because of phenolic compounds and other antioxidants (Obajuluwa *et al.* 2024). Phenolic compounds have been reported to reduce lipid peroxidation as it has the ability to scavenge for free radicals (Tang *et al.* 2001). In addition, total cholesterol, triglycerides, Very Low Density Lipoprotein (VLDL), and Low Density Lipoprotein (LDL) were reduced in chicken meat with the inclusion of Yohimbe in diets. These low density variant of lipoproteins are not desired by consumers because of health concerns (Yuan *et al.* 2025). The reduction of these lipoproteins could be as a result of Yohimbe ability to modulate lipid metabolism and improve lipid profiles (Ostojic, 2006). High Density Lipoprotein (HDL) was however increased compared with the control samples. HDL are referred to as good cholesterol as they are needed for the maintenance of health and vitality (Hou *et al.* 2024).

This study elucidated the influence of Yohimbe on carcass and some meat quality characteristics of broiler chickens. Although the inclusion of Yohimbe at 360 mg/Kg was better on sensory scores, 300mg/Kg was the most effective dose for optimum oxidative stability and lipid profiles such as VLDL, triglycerides and HDL.

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