

Nutrient Digestibility and Growth Performance of Finisher Broilers Given Dried *Xylopia aethiopica* Fruits (Grains of Selim) As Additive

ABSTRACT

The nutrient digestibility and growth performance of finisher broilers given dried *Xylopia aethiopica* fruits (grains of selim) as additive was investigated. One hundred and ninety-five finisher broilers (Arbor acres strain), 28-day old were randomly shared-assigned into five treatments with each treatment having three replicates. Blended grains of selim was administered orally through drinking water on treatments 2, 3, 4 and 5 at concentrations of 0.4, 0.6, 0.8 and 1.0g per litre respectively while birds on treatment 1 (control) received 0.3g/litre of antibiotics (doxygen). Birds were fed *ad libitum* with the same isoproteinous and isocaloric diet containing 20% crude protein and 2905.95 Kcal/kg metabolisable energy for 28 days. Results showed no significant ($P>0.05$) differences among treatments in the final body weight, total weight gain, daily weight gain, total feed intake, daily feed intake and feed conversion ratio. Nutrient digestibilities were similar ($P>0.05$) in all across treatment groups. Results of this study demonstrated that grains of selim could be used as a substitute for antibiotic growth promoters. The growth performance obtained was a true reflection of the nutrient digestibility and utilization efficiency of finisher broilers given the additives. [U1]

Keywords: antibiotics, finisher broilers, growth promoter, nutrient, digestibility, *Xylopia aethiopica* dried fruits (grains of selim).

1. INTRODUCTION

The *Xylopia aethiopica* tree is a slim, tall, evergreen, aromatic plant growing up to a height of 20m, of the order Magnoliales and family Annonaceae and found in the tropical zones of west, central and southern Africa [1]. The dried fruits of *Xylopia aethiopica* (Grains of Selim) have long been used as a spice and an herbal medicine. The use of antibiotics as growth promoters in poultry production and reports on their residual effects on consumers of poultry products have generated interest in producers trying to do without antibiotics and other drugs [2]. The need to adopt a more nutrition-based health strategy in animal production and development have been advocated [2]. This is important because consumers are now paying much more attention to quality and safety of poultry products they eat [3]. It has been observed and reported that grains of selim has antimicrobial and anthelmintic activities and promotes growth in broiler chickens [4]. Several herbal products and their extracts have been found to improve broiler performance and exhibited growth-promoting effects [5]. Therefore, it has been opined that herbal products could serve as an environmental friendly alternatives to the antibiotic growth promoters [4]. The high cost of antibiotics and other drugs in addition to the residual effects of their use has necessitated the need to research into natural herbal plants that could serve as good, cheap and natural alternatives to commercial (synthetic) antibiotics. This study was designed to investigate the effect of grains of selim (*Xylopia aethiopica* dried fruits) as additive on the nutrient digestibility, retention and growth performance of finisher broilers.

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41 2. MATERIALS AND METHODS

42 **2.1 Experimental Site:** The Poultry Research Unit of the Department of Animal Science, Delta State University,
43 Asaba Campus, Nigeria, was the experimental site. All experimental procedures used in this study were approved by
44 the Boards of Studies of the Department of Science and Faculty of Agriculture, Delta State University, Abraka,
45 Asaba Campus, Nigeria.

46 **2.2 Experimental Birds and Management:** One hundred and ninety five (195) 28 days old finisher broilers (Arbor
47 acres strain) weighing from 1377-1454.67 ±16.85 g[u2] were used in this study. -A deep litter house of fifteen pens
48 with dimensions of 2.04m x 2.03m was used in the experiment to manage the birds. Feed and water were supplied
49 *ad libitum*- throughout -the period and required vaccinations were given.

50 **2.3 Experimental Design:** The finisher broilers were randomly assigned into five treatment groups with three
51 replicates on equal weight basis in a completely randomized design. Each treatment group -had 39 birds -and -13 per
52 replicate.

53 **2.4 Experimental Diets:** Birds were fed the same isoproteinous and isocaloric diet containing 20% crude protein
54 and 2905.95Kcal/kg metabolizable[u3] energy. Well -blended powdered grains of selim was obtained by pulverizing
55 with mortar and pestle, milling with homogenizer and passed through a standard 2mm sieve to remove all fibrous
56 materials. Weights of 0.4, 0.6, 0.8g and 1.0g of grains of selim were dissolved in a litre of water each for more than
57 10 hours and given to broilers in treatments 2, 3, 4 and 5 as their drinking water, while broilers in treatment 1
58 (Control) were given antibiotics in their water (0.3g per litre of water). The proximate and phytochemical
59 compositions of *Xylopi aethiopica* dried fruits(grains of selim) are presented in Table 1. The composition of the
60 finisher broiler diet is presented in Table 2.

61 **2.5 Measurements:** The mean body weight-, body weight gain, feed intake and mortality data were collected in
62 each replicate- weekly. Feed conversion, which is a ratio of feed consumed and the weight gained over a specific
63 period was -also calculated-.

64 **2.6 Metabolic Trials :**At the end of 28 days when the birds were 8 weeks old, one bird per replicate
65 weighing close to the general average body weight (3290.20 ± 45.12g) were selected from the five
66 treatment groups for metabolic study. Birds were kept individually in battery cages and provided with
67 feed and water *ad libitum*. After an adjustment period of three days, dropping trays covered with
68 aluminium foil paper were placed under the cages for total excreta collection for three days. The faecal
69 droppings from each replicate were oven dried at low temperature range of 60-80°C to minimise[u4] loss
70 of nitrogen to a -constant weight. The total collection from each replicate were then bulked, weighed and
71 milled to pass through a standard 2mm sieve, and representative samples of the droppings and
72 experimental diet were analysed[u5] for their proximate compositions for the determination of nutrient
73 digestibility and retention.

74 **2.7 Chemical Analysis:** The proximate compositions of grains of selim, experimental diet and faecal samples
75 were determined according to AOAC [6] procedure and the phytochemical analysis was carried out by the
76 methods of Sofowora [7] and Trease and Evans [8].

77 **2.8 Statistical Analysis:** All data collected were subjected to one way analysis of variance (ANOVA) for
78 completely randomized design using -SPSS [9] -statistical package. -Significant differences -among the treatment
79 means were separated using Duncan -multiple range test [10].

Table 1. Proximate and Phytochemical Compositions of dried *Xylopi* *aethiopica* ~~Dried~~ fruits

Parameters %		Phytochemical Test	Results
Dry matter	87.95	Flavonoid	+++
Ash(%)	5.84	Tannin	++++
Crude fibre	10.51	Alkaloid	++
Crude protein	2.73	Steroid	++
Ether extract	9.9	Saponin	+
Nitrogen free extract	58.97	Carbohydrate	+

+ = slightly present, ++= moderately present, +++= present, ++++= strongly present

3. RESULTS

The results of the phytochemical analysis showed that grains of -selim -contain- the following -phytochemicals: alkaloids, tannins, flavonoids, steroids, saponin and carbohydrates.

The results of the performance characteristics of the finisher broilers given different concentrations of grains of selim in drinking water are presented in Table 3. There were no significant ($P>0.05$) differences in final body weight, total weight gain, daily weight gain, total feed intake, daily feed intake and feed conversion ratio across the treatment groups. However, finisher broilers in treatments given grains of selim had slightly-numerically higher values in final body weight, total weight gain, daily weight gain and feed conversion ratio than compared with broilers in treatment 1 given antibiotic. The results of nutrient digestibility of finisher broilers given different concentrations of grains of selim are presented in Table 4. There were no significant ($P>0.05$) differences in ash, crude fibre, crude protein, ether extract and nitrogen free extract digestibilities across all the treatment groups.

Table 2. Composition of Experimental Finisher Broilers Diet

Ingredients	Treatments				
	T1*	T2**	T3**	T4**	T5**
	0.3g/litre (antibiotic)	0.4g/litre	0.6g/litre	0.8g/litre	1.0g/litre
Maize	58.00	58.00	58.00	58.00	58.00
Soyabean cake	17.00	17.00	17.00	17.00	17.00
Groundnut cake	9.00	9.00	9.00	9.00	9.00
Fish meal	4.00	4.00	4.00	4.00	4.00
Weath offal	5.00	5.00	5.00	5.00	5.00
Palm oil	1.20	1.20	1.20	1.20	1.20
Bone meal	3.20	3.20	3.20	3.20	3.20
Limestone	1.55	1.55	1.55	1.55	1.55
Salt	0.30	0.30	0.30	0.30	0.30
Premix	0.50	0.50	0.50	0.50	0.50
Methionine	0.15	0.15	0.15	0.15	0.15
Lysine	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00
Calculated analysis:					
Crude protein (%)	20.07	20.07	20.07	20.07	20.07
Crude fibre (%)	3.57	3.57	3.57	3.57	3.57
M E Kcal/kg	2905.95	2905.95	2905.95	2905.95	2905.95
Determined analysis:					
Dry matter (%)	87.84	87.84	87.84	87.84	87.84
Ash (%)	9.22	9.22	9.22	9.22	9.22
Crude fibre (%)	11.33	11.33	11.33	11.33	11.33
Crude protein (%)	20.86	20.86	20.86	20.86	20.86
Ether extract (%)	3.09	3.09	3.09	3.09	3.09
Nitrogen free extract (%)	43.34	43.34	43.34	43.34	43.34

Each 2.5kg of finisher vitamine-mineral premix (Bio Organic nutrient systems LTD Nigeria) provided the following vitamins and minerals. Vit A, 8,500,000.00 I.U; Vit D3,1,500,000.00 I.U; Vit E, 10,000.00 I.U; Vit K3,1,500.00mg; Vit B1,1,600.00mg; Vit B2,4000.00mg; Niacin, 20,000.00mg; Pantothenic acid; 5000.00mg; Vit. B6, 1,500.00mg; Vit B12, 10.00mg; Folic acid,500.00mg; Biotin 750.00mg, Choline chloride175,000.00mg, Cobalt 200.00mg; Copper 3,000.00mg;Iodine 1,000.00mg; Iron, 20mg,Manganise,40,000.00; Selenium200.00; Zinc30.000.00; Antioxidant, 1,250.00 *Antibiotics (Doxy-gen 20/20 WSP : Doxycycline d hyclate 200mg and Gentamicine de sulfate 200mg)

**Grain of selim. ME: Metabolizable energy.

Table 3.: Performance Characteristics of Finisher Broilers Given Different Concentrations of *dried* *Xylopi* *aethiopica* ~~Dried~~ Fruits (grains of selim) in Drinking Water.

Parameters	Treatments					SEM	SIG
	T1*	T2**	T3**	T4**	T5**		
	0.3g/litre	0.4g/litre	0.6g/litre	0.8g/litr	1.0g/litre		
Initial weight (g)	1431.00	1454.67	1421.00	1377.00	1431.33	16.85	NS
Final body weight (g)	3186.00	3274.33	3181.33	3415.33	3394.00	45.12	NS
Total weight gain (g)	1754.00	1867.67	1789.33	2009.33	1891.33	47.72	NS
Daily weight gain (g)	62.64	66.70	63.90	71.76	67.55	170.46	NS
Total feed intake (g)	4786.00	4888.67	4751.67	4727.67	4543.00	76.20	NS
Daily feed intake (g)	170.93	174.60	169.70	168.84	162.25	27.22	NS
Feed conversion ratio	2.74	2.65	2.67	2.34	2.42	0.071	NS

*Antibiotics (Doxy-gen 20/20 WSP : Doxycycline d'hyclate 200mg and Gentamicine de sulfate 200mg)

**Grains of selim

NS: Not significant

Table 4 Nutrient Digestibility of Broilers Given Different Concentrations of *dried* *Xylopi* *aethiopica* ~~Dried~~ Fruits (grains of selim) in Drinking Water

Parameters	Treatments					SEM	SIG
	T1*	T2**	T3**	T4**	T5**		
	0.3g/litre	0.4g/litre	0.6g/litre	0.8g/litre	1.0g/litre		
Ash %	88.53	80.7	90.28	90.17	92.49	1.87	NS
Crude fibre %	91.83	82.86	88.31	88.27	90.50	1.88	NS
Crude protein %	92.11	83.7	91.69	94.41	94.51	1.61	NS
Ether extract %	82.79	72.98	69.83	76.22	87.53	4.23	NS
Nitrogen free extract %	78.45	78.95	72.07	77.06	81.53	5.05	NS
Digestibility of feed %	82.30	81.72	82.98	84.37	85.57	0.71	NS

*Antibiotics (Doxy-gen 20/20 WSP: Doxycycline d'hyclate 200mg and Gentamicine de sulfate 200mg)

**Grains of selim. NS: Not significant

4. DISCUSSION

The results of the phytochemical analysis -showed that grains of selim has alkaloid, flavonoid, tannin, steroid and carbohydrate present in it while saponin is marginally present. These phytochemicals have been documented to possess analgesic, antispasmodic and bactericidal activities, have been found to be antimicrobial substances against a wide array of microorganisms *in vitro*, effective antioxidant and anti carcinogenic properties, they also lower the

172 risk of heart diseases and have important relationship with sex hormones [7,11, 12]. The identified
173 phytochemical compounds obtained in this study may be the bioactive constituents of this spice. Grains of selim ~~is~~
174 therefore, ~~proving~~ to be a -valuable reservoir of bioactive compounds of substantial medicinal merit -[11]. -In line
175 with the present observation, phytochemical screening of *Xylopi aethiopica* -oil revealed the presence of plant
176 sterols and phenolic compounds such as flavonoids, tannins and the saponins [13, 14, 15, 16].

177 The similarities in the final body weights, total weight gain, daily weight gain, total feed intake, daily feed intake
178 and feed conversion ratio ~~in~~ (Table 3), is an indication that finisher broilers in all treatment groups responded
179 positively in growth performance to the diet and additives supplied. The growth performance pattern in treatment 1
180 given antibiotic (Doxo-gen 20/20 WSP : Doxycycline d'hyclate 200mg and Gentamicine de sulfate 200mg)
181 compared to the other treatments given grains of selim indicate that grains of selim has growth promoting potentials
182 just like antibiotics, therefore grains of selim can be used to replace antibiotics as additive in finisher broiler
183 production. These results are similar to the improved growth performance obtained [4] when different
184 concentrations of grains of selim in drinking water was given to broiler chicks, and similar to reports on antibiotics
185 growth promoters. Similarly improved body weight gain, daily feed intake and feed conversion ratio was observed
186 in broilers fed powder or aqueous extract of garlic compared to those fed control diet [17, 18, 19, 20]. The results of
187 this study agree with the findings on dietary ginger [21, 22, 23, 24, 25] and thyme [26, 27, 28, 29, 30] which also
188 gave improved body weight gain in broilers. These authors ~~on dietary ginger [21, 22, 23, 24, 25] and thyme [26,~~
189 ~~27, 28, 29, 30]~~ concluded that thyme and ginger (oil, powder or aqueous extract) could ~~be~~ promising natural
190 alternatives ~~to~~ antibiotics growth promoters. The similarities in feed intake and feed conversion ratio, which
191 conform to the growth pattern of the birds in this study ~~also~~ agree with earlier observation where the efficacy of
192 ginger [21, 22, 23, 24, 25] and thyme [26, 27, 28, 29, 30] were compared with the reports of these authors antibiotics.
193 The improved performance of birds as a result of grains of selim may be attributed to the presence of the several
194 bioactive compounds in the fruits (Carbohydrates, flavonoids, sterols, saponins, tannins, and alkaloids) which have
195 biological activities such as antioxidant, antimicrobial and pharmacological effects [4]. ~~However~~ The final weight of
196 broiler finishers given different concentrations of grains of selim compared to the ~~control~~ revealed ~~that~~ grains of
197 selim ~~can~~ could replace antibiotics ~~in~~ broiler finishers ~~with~~ positive effect ~~on~~ ~~body~~ weight performance.

198 The similarities in digestibility of all nutrients across the treatment groups is an indication that nutrient
199 utilization efficiency of broiler finishers given different concentrations of grains of selim were not
200 adversely affected. The results of nutrient digestibility followed the pattern of the growth performance of
201 the treatment groups, indicating that nutrient utilization ~~proceeded at the same rate and efficiency whether~~
202 ~~broilers were given grains of selim or antibiotics as additive was similar across treatment groups. The~~
203 ~~ability of birds given grain of selim to compete favorably with those given antibiotics could be due to the~~
204 ~~antimicrobial and antioxidant properties of grains of selim, which created favorable gut environment for~~
205 ~~efficient nutrient utilization. However, this contention warrants further investigation. The notably high~~
206 ~~values of nutrient digestibility of broiler finishers given grains of selim and antibiotics as additives,~~
207 ~~showed that their antimicrobial and antioxidant properties helped to provide a favourable and conducive~~
208 ~~internal environment within the birds systems for efficient utilization of available nutrients for high~~
209 ~~productivity, which in this case is the growth performance. The daily weight performance of the broilers~~
210 ~~was, therefore, a true reflection of the efficiency of nutrient digestibility and utilization.~~ [6]

211 5. CONCLUSION

212 ~~The growth performance and the efficient utilization of nutrients as revealed by the high values of nutrient~~
213 ~~digestibility and growth, indicate that *Xylopi aethiopica* dried fruits (grains of selim) can give improve nutrient~~
214 ~~digestibility and growth in broiler finishers. The antimicrobial and antioxidant properties of grains of selim already~~
215 ~~reported may have provided a conducive internal environment within the birds for high and improved~~
216 ~~performance. *Xylopi aethiopica* can serve as a natural alternative to antibiotics as a growth promoter in broiler~~

finisher production. The similarity in growth performance and nutrient digestibilities between birds fed grains of selim and antibiotics indicates that grains of selim could replace antibiotics in promoting health and growth performance in broiler finishers. Further studies to determine the mode of action of grain of selim such as its effect on gut microbiology and morphology are suggested.

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