

Original Research Article

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

ABSTRACT

The nutrient digestibility, retention and growth performance of finisher broilers given *Xylopia aethiopica* dried fruits (grains of selim) as additive was investigated. One hundred and ninety five finisher broilers (Arbor acres strain), 28 days old were randomly shared into five treatments with each treatment having three replicates. Well blended grains of selim was administered through drinking water on treatments 2, 3, 4 and 5 at concentrations of 0.4, 0.6, 0.8 and 1.0g per litre 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 metabolizable 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 digestibility and retention were similar ($P>0.05$) in all treatment groups. Results showed that grains of selim has growth promoting potentials and that the growth performance obtained was a true reflection of the nutrient digestibility, retention and utilization efficiency of finisher broilers given the additives.

Keywords: *antibiotics, finisher broilers, growth promoter, nutrient, digestibility, retention, 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]. [4] observed and reported that grains of selim has antimicrobial and anthelmintic activities and promotes growth in broiler chickens. Several herbal products and their extracts have been found to improve broiler performance and resulted in growth-promoting effects [5]. [4] is of the opinion that herbal product could serve as an environmental friendly alternatives to the antibiotic growth promoters. 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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40 2. MATERIALS AND METHODS

41 **2.1 Experimental Site:** The Poultry Research Unit of the Department of Animal Science, Delta State University,
42 Asaba Campus, Nigeria, was the experimental site.

43 **2.2 Experimental Birds and Management:** One hundred and ninety five (195) 28 days old finisher broilers (Arbor
44 acres strain) weighing from 1377-1454.67g were used in this study. A deep litter house of fifteen pens with
45 dimensions of 2.04m x 2.03m was used in the experiment to manage the birds. Feed and water were supplied *ad*
46 *libitum* throughout the period and required vaccinations were given.

47 **2.3 Experimental Design:** The finisher broilers were randomly shared into five treatment groups with three
48 replicates on equal weight basis in a completely randomized design. Each treatment group had 39 birds and 13 per
49 replicate.

50 **2.4 Experimental Diets:** Birds were fed the same isoproteinous and isocaloric diet containing 20% crude protein
51 and 2905.95Kcal/kg metabolizable energy. Well blended powdered grains of selim was obtained by pulverizing
52 with mortar and pestle, milling with homogenizer and passed through a standard 2mm sieve to remove all fibrous
53 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
54 10 hours and given to broilers in treatments 2, 3, 4 and 5 as their drinking water, while broilers in treatment 1
55 (Control) were given antibiotics in their water (0.3g per litre of water). Grains of selim was used to replace
56 antibiotics in the drinking water of finisher broilers in treatments 2, 3, 4 and 5 whenever birds in treatment 1 were
57 given antibiotics. The proximate and phytochemical compositions of *Xylopi aethiopica* dried fruits(grains of selim)
58 are presented in Table 1. The composition of the finisher broiler diet is presented in Table 2.

59 **2.5 Measurements:** The mean body weight, body weight gain, feed intake and mortality were recorded on replicate
60 basis weekly. Feed conversion which is a ratio of feed consumed and the weight gained over a specific period was
61 also calculated.

62 **2.6 Metabolic Trials :**At the end of 28 days when the birds were 8 weeks old, one bird per replicate
63 weighing close to the general average body weight were selected from the five treatment groups for
64 metabolic study. Birds were kept individually in battery cages and provided with feed and water *ad*
65 *libitum*. After an adjustment period of three days, dropping trays covered with aluminium foil paper were
66 placed under the cages for total excreta collection for three days. The faecal droppings from each replicate
67 were oven dried at low temperature range of 60-80°C to minimize loss of nitrogen to a constant weight.
68 The total collection from each replicate were then bulked, weighed and milled to pass through a standard
69 2mm sieve, and representative samples of the droppings and experimental diet were analysed for their
70 proximate compositions for the determination of nutrient digestibility and retention.

71 **2.7 Chemical Analysis:** The proximate compositions of grains of selim, experimental diet and faecal samples
72 were determined according to the procedure of [6] and the phytochemical analysis was carried out by the methods
73 of [7] and [8].

74 **2.8 Statistical Analysis:** All data collected were subjected to one way analysis of variance (ANOVA) for
75 completely randomized design using [9] statistical package. Significant differences among the treatment means
76 were separated using Duncan multiple range test [10].

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79 **Table 1. Proximate and Phytochemical Compositions of *Xylopia 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	+

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

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82 3. RESULTS

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

85 The results of the performance characteristics of the finisher broilers given different concentrations of grains of
86 selim in drinking water are presented in Table 3. There were no significant ($P>0.05$) differences in final body
87 weight, total weight gain, daily weight gain, total feed intake, daily feed intake and feed conversion ratio in all the
88 treatment groups. However, finisher broilers in treatments given grains of selim were generally better than
89 broilers in treatment 1 given antibiotics in final body weight, total weight gain, daily weight gain and feed
90 conversion ratio. The results of nutrient digestibility of finisher broilers given different concentrations of
91 grains of selim are presented in Table 4. There were no significant ($P>0.05$) differences in ash, crude
92 fibre, crude protein, ether extract and nitrogen free extract digestibilities in all treatment groups.

93 4. DISCUSSION

94 The results of the phytochemical analysis showed that grains of selim has alkaloid, flavonoid, tannin, steroid and
95 carbohydrate present in it while saponin is marginally present. These phytochemicals have been documented to
96 possess analgesic, antispasmodic and bactericidal activities, have been found to be antimicrobial substances against
97 a wide array of microorganisms *in vitro*, effective antioxidant and anticancerous properties, they also lower the risk
98 of heart diseases and have important relationship with sex hormones [7,11, 12]. The identified phytochemical
99 compounds obtained in this study may be the bioactive constituents of this spice. Grains of selim is therefore,
100 proving to be a valuable reservoir of bioactive compounds of substantial medicinal merit [11]. [13, 14, 15, 16]
101 also reported similar findings when they carried out phytochemical screening of *Xylopia aethiopica* oil and observed
102 the presence of plant sterols and phenolic compounds such as flavonoids, tannins and the saponins.

103 The similarities in the final body weights, total weight gain, daily weight gain, total feed intake, daily feed intake
104 and feed conversion ratio in Table 3. is an indication that finisher broilers in all treatment groups responded
105 positively in growth performance to the diet and additives supplied. The growth performance pattern in treatment 1
106 given antibiotic (Doxy-gen 20/20 WSP : Doxycycline d'hyclate 200mg and Gentamicine de sulfate200mg)
107 compared to the other treatments given grains of selim indicate that grains of selim has growth promoting potentials
108 just like antibiotics, therefore grains of selim can be used to replace antibiotics as additive in finisher broiler
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112 **Table 2. Composition of Experimental Finisher Broilers Diet**

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Treatments

		T1*	T2**	T3**	T4**	T5**
	Ingredients	0.3g/litre (antibiotic)	0.4g/litre	0.6g/litre	0.8g/litre	1.0g/litre
118	Maize	58.00	58.00	58.00	58.00	58.00
119	Soyabean cake	17.00	17.00	17.00	17.00	17.00
120	Groundnut cake	9.00	9.00	9.00	9.00	9.00
121	Fish meal	4.00	4.00	4.00	4.00	4.00
122	Weath offal	5.00	5.00	5.00	5.00	5.00
123	Palm oil	1.20	1.20	1.20	1.20	1.20
124	Bone meal	3.20	3.20	3.20	3.20	3.20
125	Limestone	1.55	1.55	1.55	1.55	1.55
126	Salt	0.30	0.30	0.30	0.30	0.30
127	Premix	0.50	0.50	0.50	0.50	0.50
128	Methionine	0.15	0.15	0.15	0.15	0.15
129	Lysine	0.10	0.10	0.10	0.10	0.10
130	Total	100.00	100.00	100.00	100.00	100.00
131	Calculated analysis:					
132	Crude protein (%)	20.07	20.07	20.07	20.07	20.07
133	Crude fibre (%)	3.57	3.57	3.57	3.57	3.57
134	M E Kcal/kg	2905.95	2905.95	2905.95	2905.95	2905.95
135	Determined analysis:					
136	Dry matter (%)	87.84	87.84	87.84	87.84	87.84
137	Ash (%)	9.22	9.22	9.22	9.22	9.22
138	Crude fibre (%)	11.33	11.33	11.33	11.33	11.33
139	Crude protein (%)	20.86	20.86	20.86	20.86	20.86
140	Ether extract (%)	3.09	3.09	3.09	3.09	3.09
141	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 IU; Vit D3,1,500,000.00 IU; Vit E, 10,000.00 IU; 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 *Xylopia aethiopica* Dried Fruits (grains of selim) in Drinking Water.

Treatments

Parameters	T1* 0.3g/litre	T2** 0.4g/litre	T3** 0.6g/litre	T4** 0.8g/litr	T5** 1.0g/litre	SEM	SIG
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 and Retention of Broilers Given Different Concentrations of *Xylopi aethiopica* Dried Fruits (grains of selim) in Drinking Water

Parameters	Treatments					SEM	SIG
	T1* 0.3g/litre	T2** 0.4g/litre	T3** 0.6g/litre	T4** 0.8g/litre	T5** 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

production. These results are similar to what was reported by [4] who gave different concentrations of grains of selim in drinking water to broiler chicks and obtained improved growth performance just like that of antibiotics growth promoters. [17, 18, 19, 20] who reported that garlic (powder or aqueous extract) as an additive in broiler production produced improved body weight gain, daily feed intake and feed conversion ratio. The result of this study is also in line with the findings of [21, 22, 23, 24, 25] who reported improved body weight gain in broilers when ginger (*Zingiber officinale*, a spice) was used at different rates in feed or drinking water as an additive. When thyme was used as an additive in broiler production by [26, 27, 28, 29, 30] they obtained improved body weight performance and concluded that thyme oil or powder may be a promising alternative to antibiotics growth promoters. The similarities in feed intake and feed conversion ratio which conform to the growth pattern of the birds in this study also agree with the reports of these authors. The improved performance of birds as a result of grains of

selim may be attributed to the presence of the several bioactive compounds in the fruits (Carbohydrates, flavonoids, sterols, saponins, tannins, and alkaloids) which have biological activities such as antioxidant, antimicrobial and pharmacological effects (Isikwenu, 2014). However the final weight of finisher broiler birds given different concentrations of grains of selim in their drinking water which are treatments 2 to 5 compared to the control treatment indicate that broiler birds can be given all concentrations of grains of selim in drinking water from 0.4g/litre to 1.0g/litre with positive effect on body weight performance.

The similarities in digestibility and retention for all nutrients in the treatment groups is an indication that nutrient utilization efficiency of finisher broilers given different concentrations of grains of selim were not adversely affected. The results of digestibility and retention followed the pattern of the growth performance of the treatment groups, indicating that nutrient utilization proceeded at the same rate and efficiency whether broilers were given grains of selim or antibiotics as additive. The notably high values of nutrient digestibility and retention of finisher broilers given grains of selim and antibiotics as additives, showed that their antimicrobial and antioxidant properties helped to provide a favourable and conducive internal environment within the birds systems for efficient utilization of available nutrients for high productivity, which in this case is the growth performance. The daily weight performance of the broilers was, therefore, a true reflection of the efficiency of nutrient digestibility, retention and utilization.

5. CONCLUSION

The similarities of the growth performance and the efficient utilization of nutrients as revealed by the high values of nutrient digestibility and retention of finisher broilers in this study indicate that *Xylopiia aethiopica* dried fruits (grains of selim) has growth promoting potentials and can serve as a natural alternative to antibiotics in finisher broiler production. The antimicrobial and antioxidant properties of grains of selim provided a conducive internal environment within the birds for high and improved performance.

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