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Performance, Carcass Characteristics and Haematology of Grower Japanese Quails as Affected by Processing Methods of African Breadfruit (*Treculia africana*) Seed

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Target audience: Animal scientists, quail farmers and feed millers

Abstract

A total of two hundred seventy growing Japanese male quail birds were fed with parboiled (PB) and varying boiling time of African Breadfruit, ABF (Treculia africana) seed to evaluate the performance, carcass characteristics and haematological parameters of the growing male quail fed the African Breadfruit seed. Six dietary treatments with a control treatment (T_1) without ABF, parboiled ABFat100^{o}C(T_2) and four varying cooking intervals of 10, 20, 30 and 40 minutes starting from time of boiling representing T_3, T_4, T_5 and T_6 respectively were investigated. The birds were fed the experimental diet from 2-6weeks. Data were collected and analyzed for carcass characteristics and haematology parameters with 9 birds representing a treatment in a complete randomized design. Results shows that performance parameters of final body weight, weight gain, feed conversion ratio and cost/kg weight gain had significant ($P<0.05$) differences however, initial bodyweight, total feed intake and daily feed intake had no significant ($P>0.05$) difference. The carcass and visceral organs all had significant ($P<0.05$) differences with PB treatment having better carcass characteristics. Most of haematological parameters measured were significantly ($P<0.05$) different although PCV, RBC, heterophil and MCV had no ($P>0.05$) difference. It can be concluded that cooking African Breadfruit at parboiling time is adequate for quails performance no adverse health implications.

Key words: African Breadfruit, Performance, Carcass, Quails

Description of Problem

The African Breadfruit (*Treculia africana*) is a large fruit head known for its richness in energy, protein, minerals and vitamins (1). These nutrients can be adequately harvested when the seeds are well processed to reduce the level of some anti-nutrients in the seeds which interfere with process of digestion (2, 3). Feeding this material to Japanese quails which have the benefit of fast growth rate and attaining weights of 160 - 190g and more depending on the genetic lines within six weeks of age (4) and in some exotic type 500g could be important so as to evaluate its response in quail's performance, carcass yield and other responses. Furthermore, changes in haematological indices have the potential in interpreting the physiological, pathological and nutritional status as it reveals impart of the nutrient material or additive supplied into the diet (5). It will be important to also get available cheap and good quality feed materials which are in less competition with man which can be suitable for poultry meals (6). Therefore, this study was designed to evaluate the performance, carcass characteristics and haematological indices of growing Japanese quails fed variously processed (boiling time)African Breadfruit seed.

Materials and Methods

Description of Experimental site

The study was conducted at the Department of Animal Science Teaching and Research Farm, Ahmadu Bello University, Zaria. The geographical location of Zaria is within the Northern Guinea Savannah zone of Nigeria which lies between latitude, 11^{0}14' 44' N and longitude 7^{0}38' 65'E, at an altitude of 610mm above sea level. The climate is relatively dry, with a mean annual rainfall of 700-1400mm (7).

Method of processing of African breadfruit seed

Raw African breadfruit seeds were parboiled at 100º C for 15 minutes to facilitate dehulling. The dehulled seeds were sun dried for about 48 hours. Batches of 20kg African breadfruit seeds sun dried were subjected to various additional durations of boiling time after attaining a boiling temperature of 100º C. The additional durations includes: 10, 20, 30 and 40 minutes and each durations of boiling time represented a dietary treatment after formulation with other feed compositions (Table 1).

Experimental Design,Management and Data Collection

Two hundred and seventy (270) growing male quail were used for this study. The birds were assigned to six treatment groups with their average initial body similar. Each treatment group of 45 birds was further subdivided into three replicates of 15 birds per pen in a completely randomized design (CRD). Experimental diets and water were provided *ad libitum.*

Data were collected for performance of the quails, carcass and visceral organ characteristic and haematological

Table 1 shows the feed composition of the experiment diet with the various cooking time on African breadfruit seed

		Duration of cooking of breadfruit seeds (minutes)				
Feed Ingredients	**Control**	**PB (0)**	**10**	**20**	**30**	**40**
	T_1	**T_2**	**T_3**	**T_4**	**T_5**	**T_6**
Maize	43.00	44.00	44.00	44.00	44.00	44.00
Groundnut cake	34.72	30.87	30.87	30.85	30.87	30.85
Breadfruit seed	0.00	5.00	5.00	5.00	5.00	5.00
Soya bean cake	10.00	10.00	10.00	10.00	10.00	10.00
Wheal offal	9.23	7.08	7.08	7.10	7.08	7.10
Bone Meal	0.50	0.50	0.50	0.50	0.50	0.50
Limestone	1.60	1.60	1.60	1.60	1.60	1.60
Common Salt	0.30	0.30	0.30	0.30	0.30	0.30
Premix*	0.25	0.25	0.25	0.25	0.25	0.25
Lysine (%)	0.15	0.15	0.15	0.15	0.15	0.15
Methionine (%)	0.25	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100	100
Calculated composition						
ME (Kcal/kg)	2800.00	2859.00	2859.00	2859.00	2859.00	2859.00
Crude protein (%)	25.00	24.11	24.11	24.11	24.11	24.11
Calcium (%)	0.81	0.81	0.81	0.81	0.81	0.81
Phosphorus (%)	0.30	0.29	0.29	0.29	0.29	0.29
Crude fibre (%)	4.78	4.48	4.48	4.48	4.48	4.48
Ether Extract (%)	4.86	5.21	5.21	5.21	5.21	5.21
Lysine (%)	1.16	1.14	1.14	1.14	1.14	1.14

PB = Parboiled, T= Treatment, * Bio-mix premix supplied per kg diet: vitamin A, 10,000.00 i.u; vitamin $D_3$2,000.00 i.u; Vitamin E 23,000.00mg; Niacin 27.5mg; Vitamin $B_1$1.800mg; Vitamin B_6 30mg; Vitamin B_{12}0.015mg, Vitamin K_3 200mg; Pantothenic Acid 7,500; Biotin H_2 0.06; Folic Acid 0.75mg ; Chlorine Chloride 300.00mg; Cobalt 0.2mg; Copper 30mg; Iodine 1.00mg; Iron 200.00mg; Manganese 0.04mg; Selenium 0.2mg; Zinc 30mg; Antioxidant 1.25mg.

parameters.

Blood sampling and carcass evaluation

At the end of four weeks feeding trails, three birds from each replicate group were randomly selected for carcass and haematological analysis. 5mls of blood were collected into Ethylene Di-amine Tetra Acetic Acid (EDTA) bottles (1mg/ml) for the haematological assay. The samples were analyzed at the Clinical pathology Laboratory of the Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria.For the carcass characteristics evaluation, three birds were randomly picked per replicate, fasted overnight and slaughtered by severing the jugular vein with a knife. After immersing in warm water and manually plucking the feathers, each bird was cut, weighedwhile the relative weight was calculated by expressing the weight for the visceral organs as percentage of the live weight.

Statistical Analysis

All data collected were subjected to Analysis of Variance using (ANOVA) of **(8)**. Means separation was by of multiple comparisons using Tukey-HSD test of the SAS package.

Results and Discussions

Table 2 shows the effect of parboiled and varying boiling time on African breadfruit seed based diet on the performance of growing male Japanese quail. The result shows that feed intake and daily feed intake were not significantly (P>0.05) different however, final weight, weight gain, feed conversion ratio and cost/Kg weight gain were all significantly (P<0.05) different.The result on feed intake was highest in birds fed diet containing 20 minutes of boiling over other diets.This could be as a result of more fiber content. This result is in agreement with (9) who reported that increase in crude fibre decreases metabolizable energy thereby leading to increase feed intake to meet metebolizable energy requirement. On the various weight gains, the PB treatment (121.11g/bird) responded better than the control (113.34g/bird) and varying cooking time.This could be as a result of nutrients still intact due to less boiling and the weight depression when compared with the control which could be as a result of anti-nutrients present and reduction in amino acids content due to denaturation during boiling. This is in consonant with (10) who reported decrease in weight on consumption of boiled African bread fruit seed.

Table 2: The effect of parboiled and boiling time on African breadfruit seed based diets on Performance of growing Japanese quail

	Duration of cooking of African breadfruit seeds (minutes)						
Parameters	**T_1**	**T_2**	**T_3**	**T_4**	**T_5**	**T_6**	
	Control	**PB (0)**	**10**	**20**	**30**	**40**	**SEM**
Initial weight(g/bird)	34.44	33.33	33.33	33.33	34.42	33.33	0.79^{NS}
Final weight(g/bird)	147.78^{b}	154.44^{a}	145.56^{b}	145.56^{b}	144.33^{b}	144.44^{b}	2.94^{*}
Feed intake(g/b/day)	488.33	491.66	488.33	492.77	479.44	489.44	11.51^{NS}
Weight gain (g/bird)	113.34^{b}	121.11^{a}	112.23^{b}	111.11^{b}	108.89^{b}	111.11^{b}	3.01^{*}
Feed conversion ratio	4.68^{a}	4.63^{a}	5.57^{ab}	5.25^{ab}	5.09^{ab}	5.90^{b}	0.51^{*}
DFI (g/bird/day)	17.44	17.56	17.44	17.60	17.12	17.48	0.97^{NS}
Cost/kg weight gain (₦)	10.57^{b}	12.29^{a}	11.15^{a}	11.03^{a}	10.91^{a}	11.38^{a}	0.34^{*}

^{ab}= Means with different superscript on the same row are significantly different (P<0.05), SEM= Standard Error of Mean, PB = Parboiled. DFI=Daily feed intake, NS= Not significant.

The carcass characteristics of growing male quails fed parboiled and varying boiling time on African breadfruit seed (Table 3). The result shows that all the parameters were significantly (P< 0.05) different apart from dressed weight which was not significantly (P>0.05) different. The PB treatment did better in all the carcass characteristics but not the same for the visceral organs. All the measurement in the organs were all significantly (P< 0.05) different. The slaughter and carcass weights are reflections of performance and the reduction in weights in the various cooking groups of African breadfruit seed could be likely to leaching of vital nutrient due to increase in heating time to reduce the anti-nutritional factors. This is in line with (10) who reported leaching as a result of differently processed African breadfruit seed while percent visceral weight of the organs agrees with the findings of (11).

Table 3:Carcass characteristics of growing quails fed parboiledAfrican breadfruit seeds and Africanbreadfruit seeds cooked at 100 ^{o}C for varying length of time

Parameters	Duration of cooking of ABS (minutes)						
	T_1	T_2	T_3	T_4	T_5	T_6	
	Control	PB (0)	10	20	30	40	SEM
Live weight(g)	120.02^{b}	126.82^{a}	121.13^{ab}	121.00^{b}	119.98^{b}	120.98^{b}	2.88*
Slaughter wt(g)	117.12^{b}	123.63^{a}	117.55^{b}	117.28^{b}	116.20^{b}	118.25^{ab}	2.79*
Carcass weight(g)	108.65^{b}	116.77^{a}	111.45^{b}	110.78^{b}	110.07^{b}	111.27^{b}	2.60*
Dressed weight(g)	84.87	88.73	87.75	84.62	84.67	83.67	2.66^{NS}
Organs expressed as percentages of live weight (%)							
Heart	0.96^{bc}	0.96^{bc}	1.09^{a}	0.91^{c}	0.93^{bc}	1.05^{b}	0.06*
Gizzard	2.76^{ab}	3.12^{a}	2.90^{ab}	2.73^{ab}	2.80^{ab}	2.48^{b}	0.22*
Small intestine	4.06^{b}	4.14^{b}	4.03^{b}	3.75^{b}	4.75^{a}	4.04^{b}	0.24*
Liver	1.24^{c}	1.45^{bc}	1.53^{bc}	1.63^{a}	1.60^{b}	1.53^{bc}	0.16*

^{abcd}= Means with different superscript on the same row are significantly different (P< 0.05), SEM= Standard Error of Mean, NS= Not significant.

Table 4 shows the haematological parameters of growing quails fed parboiled and varying boiling time on African breadfruit seed. The result shows that packed cell volume, heterophil, red blood cell, and mean corpuscular volume were not significantly (P>0.05) different however the various cooking time of African breadfruit seed had significant (P<0.05) effect on haemoglobin, white blood cell, total protein, lymphocyte, mean corpuscular haemoglobin and mean corpuscular haemoglobin count. The galloping increment of TP in the study is agreement with the findings of (12) who reported an increase TP. Also, the levels of Hb, PCV, MCV, MCH and MCHC of Japanese quails in this study in respective of the cooking time were within the normal range for the Japanese (12). The result observed in PCV, Hb and MCHC obtained were similar with those of (12) while the differences in PCV, heterophil, RBC and MCV were in agreement with (14).

Table 4: The effect of duration of cooking of African breadfruit seeds on Haematological parameters on growing Japanese quail birds

	Duration of cooking of ABS (minutes)						
	T_1	T_2	T_3	T_4	T_5	T_6	
Parameters	Control	PB (0)	10	20	30	40	SEM
PCV (%)	42.67	39.67	42.83	41.67	38.17	43.38	3.30^{NS}
Hb (g/dl)	14.18^{a}	8.20^{b}	12.58^{a}	12.18^{a}	9.37^{b}	14.58^{a}	1.25*
WBC (x10^{9}/l)	5.65^{b}	6.12^{a}	5.07^{bc}	5.78^{ab}	4.37^{c}	5.70^{ab}	0.55*
TP (g/dl)	3.33^{b}	4.17^{a}	3.27^{bc}	4.07^{ab}	2.70^{c}	3.80^{ab}	0.37*
Heat (%)	13.00	12.50	9.83	12.00	10.50	11.67	1.76^{NS}
Lymph (%)	86.33^{ab}	84.50^{b}	85.83^{ab}	86.33^{ab}	89.17^{a}	87.83^{ab}	1.72*
RBC (x10^{6}/l)	7.15	6.58	7.33	6.93	6.47	7.32	0.61^{NS}
MCV (fl)	59.80	60.25	58.52	60.10	59.21	59.42	0.91^{NS}
MCH (pg)	19.87^{a}	12.43^{c}	17.35^{b}	17.80^{ab}	14.93^{bc}	19.98^{a}	1.77*
MCHC (g/dl)	33.23^{a}	20.63^{c}	29.44^{b}	29.62^{ab}	25.15^{bc}	33.64^{a}	2.75*

^{ab}= Means with different superscript on the same row are significantly different (P<0.05), SEM= Standard Error of Mean , PCV= packed cell volume, Hb= haemoglobin, WBC= white blood cell, TP= total protein, Heat= heterophil , Lymph= lymphocyte, RBC= red blood cell, MCV= mean corpuscular volume, MCH= mean corpuscular haemoglobin and MCHC= mean corpuscular haemoglobin count, NS= Not significant.

Conclusion and Application

1. Cooking African Breadfruit seed at the parboiling time is adequate for performance and good carcass yield since the nutrient are not leached away.
2. The cooking time at the parboiling time was adequate as no pathological health issues were observed.

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