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Quantitative Substitution of Raw Baobab (*Adansonia digitata*) Seed Meal for Soyabean Meal in Broiler Starter Diet

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Abstract: A 28-day feeding trial involving 150 day old Anak broiler chicks was carried out to study the effect of quantitative substitution of raw baobab (*Adansonia digitata*) seed meal (RBSM) for soyabeans meal in broiler starter diet. The birds were grouped into five dietary treatments of 0, 5, 10, 15 and 20 levels of inclusion of Raw Baobab Seed Meal (RBSM), in a completely randomized design. Feed and water were offered to birds *ad libitum.* Result of productive performance shows significant differences ($p<0.05$) between treatments for all the parameters considered. Feed intake, final body weight increased with increase in level of inclusion of the test ingredient. 10% level of inclusion of RBSM give better productive performance among the inclusion levels. This indicate that 10% RBSM can be used in broiler starter diet without negative effect on productive performance.

Key words: Productive performance, broiler chicks, raw baobab seed meal, starter diet

INTRODUCTION

In Nigeria the level of animal protein consumption is low. Saulawa *et al*. (2012) reported that this low level of animal protein intake by Nigerians has been generally attributed to the short fall in its production due to closer of poultry farms, Madubuike and Ekenyem (2006) advocated that the persistent decline in the poultry industry and its consequences on the sub-optimal animal protein consumption by Nigerians as a dangerous signal to imminent animal protein malnutrition. Earlier (Esonu *et al*., 2001) had reported that 50% of the Nigerian poultry farms have closed down and another 30% were forced to reduce their production capacity because of shortage of feed. The feed shortage has been blamed on high cost of conventional feed ingredients which Onwudike (2000) have rated at 70-80% of the total cost of poultry production. Hence the need to source for alternative but promising feedstuffs. One of such alternative is baobab (*Adansonia digitata)* seed. Baobab (*Adansonia digitata*), locally called kuka (Hausa) and luru (Yoruba) which is another non-conventional feedstuff that is readily available and under-utilized but holds much agronomic potentials. There is therefore, the need to assess the potentials of such crop as a feedstuff for poultry production. It was against this back drop that, this study was embarked up on to evaluate the effect of quantitative substitution of raw baobab seed meal for soyabeans meal in broiler starter diet.

MATERIALS AND METHODS

This experiment was conducted at the poultry unit of the Teaching and Research farm of Abia State University, Umudike Campus. Raw Baobab Seeds (RBS) were collected from kaita village in Katsina state, Nigeria. The raw baobab seeds were milled and incorporated into the diets.

One hundred and fifty day-Old Anak broilers were housed in 15 pens with 10 birds in each pen measuring 3 x 3m^2. Brooding/ experimentation lasted for four weeks and kerosene stoves served as heat source. Tarpaulin was used to cover the wire netting parts of the building to prevent cold during nights.

The birds had unrestricted access to feed and clean fresh drinking water. They were vaccinated against Newcastle disease with NDV (I/O) and NDV (lasota) at day old and 4th week, respectively and Gumboro disease with Gumboro vaccine at 9th and 21st day. They were also given coccidiostat and antibiotics (KEPROCERYL WSP) through drinking water at 3rd weeks of age. Vitalyte was given at the end of every vaccination to reduce stress and combat dehydration.

The 150 Birds were allotted to five experimental diets, Diet one was soybeans based (control) diet, while the test feedstuff (raw baobab seed meal) quantitatively replaced 5, 10, 15 and 20 part soybeans in diet 2, 3, 4 and 5, respectively in a completely randomized design. The experimental diets were essentially iso-caloric and iso-nitrogenous (Table 1). The birds were randomly assigned to these diets. Feed and water was given *ad-libitum* throughout the experimental period. This experiment lasted for 28 days. Feed intake was determined daily and weight gain was determined weekly.

Evaluation of Carcass characteristics was carried out as described by Abdu (2012), this involved selection of nine broilers per treatment i.e., three birds per replicate (birds

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Table 1: Composition of experimental diets containing graded levels of raw baobab seed meal fed at starter phase

	Level of inclusion (%)				
Ingredients	0 (D1)	5 (D2)	10 (D3)	15 (D4)	20 (D5)
Maize	49.80	49.80	49.80	49.80	49.80
Soyabeans	27.50	22.50	17.50	12.50	7.50
RBSM	0.00	5.00	10.00	15.00	20.00
Blood meal	5.00	5.00	5.00	5.00	5.00
Palm kernel cake	9.00	9.00	9.00	9.00	9.00
Fishmeal	3.00	3.00	3.00	3.00	3.00
bone meal	3.00	3.00	3.00	3.00	3.00
Oyster shell	2.00	2.00	2.00	2.00	2.00
Vitamin premix*	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10
TOTAL	100.00	100.00	100.00	100.00	100.00
Determined composition (%)					
Crude Protein	22.18	22.10	22.06	22.08	21.97
Ether Extract	4.53	4.33	4.82	5.22	4.11
Crude Fibre	4.32	5.24	5.45	5.70	5.16
Ash	12.08	5.11	5.11	5.63	5.08
Nitrogen free extract	52.35	53.22	54.84	51.46	54.17
Dry Matter	88.86	90.00	92.28	90.09	90.49
Calculated composition (%)					
Crude Protein	23.89	23.67	23.45	23.23	23.08
M.E(Kcal/Kg)	2855.00	2853.20	2851.40	2851.40	2847.80

*1kg of premix contains: Vitamins A (5, 000, 000 I.U), Vitamin D3 (1000000 I.U), Vitamin E (16000mg), Vitamin K3 (800mg), Vitamin B1 (1200mg), Vitamin B2 (22000mg), Niacin(22000mg), Calcium pontothenate (4600mg), Vitamin B6 (200mg), Vitamin B12 (10mg), Folic acid (400mg), Biotin (32mg), Choline chloride (200000mg), Manganese (948000mg), Iron (40000mg), Zinc (32000mg), Copper (3400mg), Iodine (600mg), Cobalt (120mg), selenium (48mg), Anti-Oxidant (48000mg)
RBSM: Raw Baobab Seed Meal, ME: Metabolisable energy

closest in mean weight per replicate). Selected birds were starved for 12hrs and weighed individually. Birds were slaughtered by cutting the neck close to the head with a sharp surgical blade and they were allowed to bleed completely. Scalding was done in hot water (below 100°C) and the feathers plucked off manually and individually. The head, neck, shank and viscera were removed to obtain the dressed weight and percentage dressed-weight calculated. The wings were removed by cutting interiorly, severing at the humero scapular joint. The cut was made close to the body line. Lateral cuts were made through the rib heads to the shoulder girdle and the breast was removed intact by pulling interiorly. The thigh, drumsticks and back were also dissected from each carcass. All parts were weighed and expressed as percentage dressed weight. Also, organs like heart, Liver, kidney, spleen and gizzard were weighed and expressed as percentages of dressed weight.

RESULTS AND DISCUSSION

The effects of inclusion of graded levels of raw baobab seed meal on growth performance of broiler chicken (0-28 days) are presented in Table 2. There were significant ($P<0.05$) differences among treatment means for all the parameters measured. Final body weight, mean daily weight gain and feed intake decreased with increase in the level of inclusion of the raw baobab seed meal. There were no significant ($P>0.05$) differences between 0, 5 and 10% level of inclusion of raw baobab seeds meal in terms of feed intake, final body weight and weight gain but they were significant higher than values for 15 and 20% levels of inclusion. Feed conversion ratio increased with increase in the level of inclusion of raw baobab seed meal. Birds fed 0, 5 and 10% had similar but better feed conversion ratios of 1.70, 1.86 and 1.88, respectively than birds fed diets containing 15 and 20% baobab seed meal. Percentage mortality was significantly ($P<0.05$) higher in birds on 15 and 20% inclusion levels than those on the lower levels. Protein efficiency ratio followed the same trend with feed intake, daily weight gain and final body weight. The decreased feed intake and weight gain as the level of inclusion of raw baobab seed increased in the experimental diets agrees with the findings of Oyawoye and Ogunkunle (1998) who reported similar trend in a closely related legume, raw jack beans. Uchegbu *et al*. (2004) also reported similar trend in birds fed raw Napoleon imperials seed meal. Average body weight gain was depressed in bird as the inclusion level increased. However it was more severe in group fed 20% level of raw baobab seed. The decrease in body weight with increase in level of inclusion could be attributed to decrease in feed intake and to inherent anti-nutritional factors present in raw baobab seed. Uchegbu *et al*. (2004) also reported similar trend on birds fed

Table 2: Performance of broiler chickens fed graded levels of raw baobab seed meal at starter phase

	Graded level of inclusion (%)					
Performance index g/b/d	0 (D1)	5 (D2)	10 (D3)	15 (D4)	20 (D5)	±SEM
Initial body weight	43.00	43.00	42.00	43.00	43.00	0.44
Mean final body weight	581.25^{a}	547.00^{a}	553.00^{a}	306.00^{b}	283.11^{b}	59.79
Mean daily weight gain	19.21^{a}	8.00^{a}	18.25^{a}	9.39^{b}	8.57^{c}	2.14
Mean daily feed intake	32.73^{ab}	33.50^{b}	34.32^{a}	22.16^{c}	20.72^{d}	4.01
Feed conversion ratio	1.70^{b}	1.86^{b}	1.88^{b}	2.35^{a}	2.42^{a}	0.35
Protein efficiency ration	2.64^{a}	2.43^{a}	2.41^{a}	1.92^{b}	1.88^{b}	0.21
Mortality (%)	0.00^{c}	0.00^{c}	0.00^{c}	13.33^{b}	20.00^{a}	2.48
Gross margin (**x**)	128.96^{a}	107.67^{b}	119.68^{a}	96.43^{c}	88.10^{d}	6.32

a,b,c,d,e treatment means in the same row with different superscripts are significantly (P<0.05) different

graded level of raw *Napoleona imperialis* seed meal. Ogundipe *et al*. (2000) reported depression in growth of broiler chickens fed diets containing raw limabeans. Ukachukwu *et al*. (2003b) also reported a severe depression on growth performance in birds fed 20% level of inclusion of raw Mucuna. As the level of inclusion increased FCR increased. Feed was converted more efficiently by birds fed 0-10% RBSM diets then the higher level treatments. This is in agreement with the report of Bamgbose and Nwokoro (1997), Oluyemi and Roberts (1979) and Olomu and Offiong (1980). They all reported better FCR as quality of dietary protein improved. Increasing the level of inclusion of baobab seed meal would mean increase in the concentration of anti nutritional factors in the diet and this would impair protein quality in the diet. Significant (p<0.05) differences were obtained for Protein Efficiency Ratio (PER). PER is an indication of the quality of dietary protein. Dietary protein quality can be assessed by its availability for tissue deposition. Significant (p<0.05) differences observed among dietary treatments is a reflection of differences in intestinal absorption of amino acids occasioned by levels of raw baobab seed meal. Increasing dietary level of raw baobab seed meal resulted to increase concentration of interference of anti-nutritional factor. This eventually results in increased nitrogen excretion, showing reduced protein utilization (Adeyemo and Longe, 2007). Ukachukwu *et al*. (2003a) and Akinmutimi and Okwu (2006) all reported that decrease in Net Protein Utilization (NPU) value of oil seed cakes could be attributed to their haemaglutinizing properties. The poor weight gain observed with the 15 and 20% levels of inclusion of the raw baobab seeds may be partly due to low feed intake as well as poor nutrient utilization which were due to the effect of anti-nutritional factors present in most legumes (Amaefule *et al*., 2003). The percentage mortality was significantly higher in birds fed D_4 (15%) and D_5 (20%) than D_1-D_3. This confirms the effect of toxicity of the raw baobab seed meal at high level of inclusion.

Table 3 shows the results of carcass characteristics as influenced by graded levels of inclusion of raw baobab seed meal. There were significant (p<0.05) differences for all the parameters measured. The values for the dressed weight, dressing percentage, breast, back, thigh and drumstick for the 0% RBSM diet were significantly higher than the values for the other test diets but except those fed 5 and 10% RBSM. Birds fed 20% RBSM had the lowest values in all the parameters measured.

The highly significant values observed in the 0% RBSM diet could be due to the efficient utilization of nutrients in terms of digestion, absorption and assimilation (Bamgbose and Nwokoro, 1997). All the diets (both the control and test diets) had good dressing percentage, showing that their final live weights were not due to inedible offal such as shank, intestine, head etc (Oluyemi and Robert, 1979). The result of this study is in agreement with the finding of Uchegbu *et al*. (2004) who reported that dressed weight and breast muscle of broilers decreased with increasing level of raw *Napoleona Imperialis* inclusion in the diets.

The mean organ weights as percentages of the dressed weight are shown in Table 4. There were significant (p<0.05) differences for all the parameters measured except with spleen which showed no significant (p>0.05) differences. Gizzard increased with increased level of inclusion of RBSM, with the control diet having the least value (2.41%) while 20% RBSM based diet had the highest value. The high Gizzard value observed in 15 and 20% raw baobab seed level of inclusion could be due to the increase in the fibre content of the diets, leading to increase in the activity of the gizzard (Ukachukwu *et al*., 2003a). The resultant effect of this is increased weight of the gizzard. Significant (P<0.05) differences were observed in liver weight which increased with an increase in the level of inclusion of RBSM. RBSM inclusion at 20% (1.87%) gave the highest value while the control diet (0% RBSM) had the lowest value. This result is in agreement with the findings of Saulawa *et al*. (2012) who reported that liver is a major detoxification organ and hence increase in its activity may result in its enlargement and probably increase in weight. Increase in the metabolic activity of the kidney and heart due to anti-nutritional factors had resulted in their increase in weight (Abdu, 2012).

The progressive increase in the weight of kidney could be attributed to increase activity that probably leads to increase in weight. This is perharps due to the fact that

Table 3: Carcass-part of broiler chickens fed graded levels of Raw baobab seed meal in broiler starter diet (expressed as percentage of dressed weight)

	Graded level of inclusion (%)					
Parameter	0 (D1)	5 (D2)	10 (D3)	15 (D4)	20 (D5)	SEM
Live weight (g)	581.00^{a}	547.00^{a}	553.00^{a}	306.00^{b}	283.11^{b}	59.79
Dressed weight (g)	453.18^{a}	372.31^{b}	431.34^{a}	214.20^{c}	183.93^{d}	4.93
Dressed (%)	78.00 (62.03^{a})	73.00 (58.69^{b})	178.00 (62.03^{c})	70.00 (56.79^{c})	65.00 (53.73^{d})	1.03
Breast	24.51 (29.67^{a})	21.68 (27.69^{c})	22.11 (28.64^{b})	19.81 (28.64^{b})	13.62 (21.64^{d})	1.39
Back	15.02 (22.79^{a})	14.22 (22.14^{b})	15.44 (23.11^{a})	13.31 (21.39^{c})	12.82 (20.96^{d})	0.91
Thigh	14.71 (22.55^{a})	14.00 (21.97^{b})	14.36 (22.30^{b})	11.13 (19.46^{c})	10.36 (19.00^{d})	0.73
Wings	12.53 (21.56^{a})	11.76 (20.09^{b})	12.38 (20.53^{a})	10.17 (18.53^{c})	10.00 (18.44^{c})	0.58
Drumstick	12.22 (20.44^{a})	12.23 (20.44^{a})	12.00 (20.17^{b})	11.31 (19.64^{b})	10.76 (19.09^{c})	0.98

a,b,c,d,e treatment means in the same row with different superscripts are significantly (P<0.05) different. Figures in parentheses are the transformed figures using arcsine transformation method. Those before the parentheses are the untransformed figures.

Table 4: Characteristics of internal organ of broiler chickens fed Graded level of raw baobab seed meal at starter phase.

Organ as dressed	Level of replacement of soyabeans (%)					
weight (%)	0	5	10	15	20	±SEM
Liver	1.32^{c}	1.34^{c}	1.69^{b}	1.74^{b}	1.87^{a}	0.023
	(6.55)	(6.55)	(7.27)	(7.49)	(7.71)	
Heart	0.40^{b}	0.50^{a}	0.40^{b}	0.36^{d}	0.38^{c}	0.08
	(3.63)	(4.05)	(3.63)	(3.44)	(3.53)	
Kidney	0.61^{bc}	0.062^{bc}	0.59^{c}	0.64^{b}	0.71^{a}	0.02
	(4.83)	(4.59)	(4.40)	(4.52)	(4.48)	
Spleen	0.08	0.05	0.04	0.04	0.05	0.01
	(1.62)	(1.28)	(1.15)	(1.15)	(1.28)	
Gizzard	2.41^{c}	2.65^{bc}	2.70^{ab}	2.91^{a}	2.88^{a}	0.11
	(8.91)	(9.28)	(9.46)	(9.63)	(9.81)	

a,b,c,d,e treatment means in the same row with different superscripts are significantly (P<0.05) different. Figures in parentheses are the transformed figures using arcsine transformation method. Those before the parentheses are the untransformed figures.

kidney contains rhodanase, a key enzyme in cyanide detoxification (Abdu, 2012).

From the result presented in Table 2 and based on the final body weight, feed intake, FCR, body weight gain, PER and percentage mortality as well as gross margin, raw baobab seed meal can be used up to 10% inclusion level without negatively affecting the productive performance of broiler chickens at starter phase.

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