

Effect of feeding raw and differently processed *Cassia obtusifolia* seed meal on performance, serum biochemical indices and hematological values of finisher broiler chickens.

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Target audience: Poultry farmers, Researchers, Nutritionists,

Abstract

Growth performance, haematology and serum biochemical profile of broiler chicken fed raw and differently processed *Cassia obtusifolia* seed meal was investigated. Two hundred Anak 2000 broiler chicks were divided into five groups with four replicates, in a Completely Randomized Design. Five diets were formulated; diet 1 (control), contained 0 % while diets 2, 3, 4 and 5 had 10 % of the test ingredient replacing 50 % of Soya bean meal in diet. Feed intake, feed conversion ratio and overall weight gain values recorded for T2 and T1 were similar but differed significantly ($P<0.05$) from values recorded for T3, T4, and T5 respectively. Haemoglobin, Red blood cell and serum cholesterol values for T1, T2 and T3 were similar but differed significantly ($P<0.05$) from values obtained for T4 and T5. The Packed cell volume, White Blood Cell, Mean Corpuscular volume, Mean Corpuscular haemoglobin concentration and glucose values for T1 and T2 were similar but differed significantly ($P<0.05$) from values obtained in T3, T4 and T5. It was concluded that birds fed on test ingredients processed by autoclaving performed better among birds fed test diet. This could probably imply that autoclaving method of treatment reduced the level of anti nutritional factors in the diets to a more tolerable level, thereby making the nutrients accessible to birds.

Key words: *Cassia obtusifolia*, Broiler chickens, Performance, Serum and Haematological indices

Description of Problem

Protein deficiency is widespread and has been cited as the most common form of malnutrition in developing countries (1). Nigeria's population is expected to grow to a staggering 440 million, which will make it the third most populous country in the world, after India and China (2). A huge increase in demand for animal protein sources food is envisaged, this will exacerbate the current challenge of hunger and malnutrition. Soya beans and other common legume grains are principal sources of protein for both human beings and animals. Their production is however not sufficient to meet the protein requirements of the increasing population and

expanding livestock industries (3). The heavy demand for these common legumes has given rise to a disproportionate increase in their price with resultant increase in cost of feed. Hence, recent research effort have been directed to identifying and evaluating underutilized legume seeds that are locally available, cheap and not used as items in human diets (4). Studies conducted (5, 6 and 7) on chemical properties of *Cassia obtusifolia* revealed that the seed has good nutritional properties which qualify it to be an alternative cheaper protein source for poultry. However, depressed feed intake, live weight gain and some hematological values were reported in broilers fed graded levels of raw *Cassia obtusifolia*

seed (8, 9). It is therefore pertinent to process the seed before feeding broilers. The objective of the study was to evaluate the effects of feeding raw and processed *Cassia obtusifolia* seed meal on growth performance, serum and haematological values of broilers chickens.

Materials and Methods

Experimental site

The experiment was conducted at Poultry Unit of Teaching and Research Farm of Faculty of Agriculture, Ambrose Alli University Ekpoma which lies on latitude 6° 45'N, longitude 6° 08'E on an elevation of 372 m above sea level. The area has prevailing tropical climatic condition with mean annual temperature, rainfall and humidity of 24.8°C, 1665mm and 97% respectively.

Experimental birds and management

Two hundred mixed sex broilers chicks of *Anak* 2000 strain were procured and used for the study. Prior to the arrival of the chicks, all sanitary procedures such as sweeping, cleaning and disinfection of experimental pen and other equipment were observed. The chicks were weighed in group after brooding for 3 weeks period (436 ±4g) and randomly assigned to five treatment groups of forty chicks per treatment replicated four times with 10 birds per replicate. The chicks were reared under deep litter system. All routine vaccination and management practices were carried out. The experiment lasted for 7 weeks

Sample preparation

Processing of *Cassia obtusifolia* seed

Cassia Obtusifolia seeds were manually cleaned to remove extraneous materials and unwholesome seeds. The seeds were processed as follows:

- (i) **Raw seed:** Cleaned seeds were sun dried and milled into powder using laboratory blender to pass through a 1mm sieve screen and tagged as WCOSM.

- (ii) **Boiling:** Seed samples were boiled in distilled water in the ratio of 1:10 w/v at a temperature of 100°C for 30 minutes, sun dried and milled using an attrition milling machine to obtain a particle size of 1mm mesh size gauge, and sample was tagged as BCOSM.
- (iii) **Toasting:** Seed samples were toasted using aluminum pot for 30 minutes. The seeds were removed and left to cool and later milled using the attrition machine to obtain 1mm particle size. sample was tagged as TCOSM
- (iv) **Autoclave:** The seed samples were autoclaved at a pressure of 125°C (15 lb) for 30 minutes after which the seeds were dried and milled to 1 mm mesh size and tagged as ACOSM.

Experimental diets

Birds were fed with common broilers starter diet during the brooding period and thereafter five experimental diets were formulated for finisher phase. The diets were formulated to meet the minimum crude protein requirement for finisher phase. *Cassia obtusifolia* seed meal processed by autoclaving, boiling, toasting and raw were incorporated into the five experimental diets at 0 % for control and 10 % levels for T2, T3, T4, and T5 respectively replacing 50 % of soybean meal in the diets.

Design of experiment

Two hundred day old broiler chicks were randomly allotted to five dietary treatments in a completely randomized design (CRD).

Parameters measured.

Feed intake was determined by subtracting the left over from the quantity fed the previous day. Birds were weighed in group at beginning of the trial and weekly thereafter. Electronic weighing Scale was used throughout the period of the trial. Feed conversion ratio was calculated by dividing the quantity of feed consumed by weight gain.

At the end of the feeding trials (7 weeks) four birds from each treatment group were randomly selected and fasted for a period of 12 hours prior to blood sample collection to minimize standard error in values. Blood samples were collected from the brachial vein using a sterilized disposable syringe and immediately transferred into labeled sample bottles containing an anticoagulant ethylene diamine tetra- acetic acid (EDTA) for determination of hematological parameters such as red blood cell (RBC), white blood cell (WBC), Haemoglobin (Hb) and packed cell volume (PCV). Values obtained were used to calculate mean corpuscular haemoglobin (MCH), mean corpuscular volume (MCV) and mean corpuscularhaemoglobin concentration (MCHC).
 $MCH (pg) = Hb (g/dl) \times 10 / RBC(x 10^6 / mm^3)$
 $MCV (fl) = PCV (\%) \times 10 / RBC(x 10^6 / mm^3)$
 $MCHC (\%) = Hb (g/dl) \times 100 / PCV (\%)$

Blood samples for serum biochemical analysis were collected in labeled plain sample bottles. Serum was obtained after the blood samples were allowed to clot for two hours at room temperature and centrifuged for 10 minutes at 2,000 rpm to separate the cells from the serum. Serum is preferred for estimation of biochemical substances because many of these substances are present in different concentration in the serum (10).

Data analysis

All data obtained from the study were subjected to analysis of variance (ANOVA) using Statistix 9.0 and where significant differences occurred; means were separated using Duncan's Multiple Range Test (11). The results were considered significant at 5% level of probability

Table 1: Gross composition of experimental diets (g/100g) at finisher phase

Ingredients (%)	T1 (0%) Control	T2 (10%) ACOSM	T3 (10%) BCOSM	T4 (10%) TCOSM	T5 (10%) WCOSM
Maize	52.00	52.00	52.00	52.00	52.00
SBM	20.00	10.00	10.00	10.00	10.00
GNC	12.00	12.00	12.00	12.00	12.00
COSM	-	10.00	10.00	10.00	10.00
Wheat offal	8.00	8.00	8.00	8.00	8.00
Fish meal	4.05	4.05	4.05	4.05	4.05
Table salt	0.30	0.30	0.30	0.30	0.30
Bone meal	3.00	3.00	3.00	3.00	3.00
DLMethionine	0.20	0.20	0.20	0.20	0.20
L-Lysine	0.20	0.20	0.20	0.20	0.20
Premix	0.25	0.25	0.25	0.25	0.25
TOTAL	100	100	100	100	100
Cal.Values%					
Crude protein	20.92	19.00	18.88	18.93	18.95
Crude fiber	3.55	3.87	3.87	3.87	3.87
Lysine	1.0	0.95	0.95	0.95	0.95
Methionine	0.77	0.79	0.79	0.79	0.79
Calcium	2.02	1.70	1.70	1.70	1.70
Phosphorus	1.20	0.92	0.92	0.92	0.92
ME(Kcal/kg)	2895	2825	2825	2825	2825

Premix Composition per/kg Vit A, 5000 IU, Vit D₃, 888, 000 IU, Vit.E, 12,000 mg, Vit. K₃, 1500mg, B₁ 1000 mg, Vit. B₂ 2000 mg, Vit B₆ 1600 mg, Niacin, 12,000 mg, Pantothenic acid, 2000 mg, Biotin 1000 mg, Vit. B₁₂ 3000 mg, folic acid 15000 mg, Choline, choline, 60,000 mg, Manganese, 10,000 mg, Iron, 15,000 mg, Zinc, 800 mg, Copper, 400 mg, Iodine, 80 mg, Cobalt, 40mg, ACOSM= Autoclaved *Cassia* seed meal, BCOSM=Boiled *Cassia* Seed Meal, TCOSM= Toasted *Cassia* seed meal, WCOSM= Raw *Cassia* seed meal, COSM= *Cassia obtusifolia* seed meal, GNC= Ground nut cake, SBM= Soya bean meal.

Table 2: Growth performance of broilers fed differently processed *Cassia obtusifolia* seed meal

Parameters	T1 (0 %) Control	T2 (10 %) ACOSM	T3(10 %) BCOSM	T4 (10 %) TCOSM	T5 (10 %) WCOSM	SEM	P-Value
Int. Weight(g)	438.00	434.00	432.00	439.00	437.00		
Final weight(g)	2400.00 ^a	2379.80 ^a	2172.60 ^b	1970.00 ^c	1735.00 ^d	0.99	0.0001
Overall weight gain(g)	1962.00 ^a	1945.80 ^a	1740.60 ^b	1531.00 ^c	1298.00 ^d	59.53	0.0001
Daily weight gain (g)	46.71 ^a	46.32 ^a	41.44 ^b	36.45 ^c	30.90 ^d	1.43	0.0001
Feed intake (g)	116.50	114.50	110.17	100.00	95.33	68.30	0.9484
FCR	2.49 ^c	2.47 ^c	2.66 ^{bc}	2.74 ^b	3.08 ^a	0.09	0.9157

Superscript abcd = Means within the same row having different superscripts are significantly different (P<0.05), CRT=Control, ACOSM= Autoclaved *Cassia obtusifolia* seed meal, BCOSM=Boiled *Cassia obtusifolia* seed meal, TCOSM= Toasted *Cassia obtusifolia* seed meal, WCOSM= Raw *Cassia obtusifolia* seed meal, FCR= Feed conversion Ratio

Table 3: Haematological indices of broiler chickens fed raw and differently processed *Cassia obtusifolia* seed meal

Parameters	T1 (0%) CRT	T2 (10%) ACOSM	T3 (10%) BCOSM	T4 (10%) TCOSM	T5 (10%) WCOSM	SEM	P-Value
Hb (g/dl)	8.30 ^a	8.27 ^a	8.00 ^a	7.27 ^b	6.42 ^c	0.55	0.0001
RBC(x10 ⁶ /ml)	3.23 ^a	3.15 ^a	3.05 ^a	2.40 ^b	2.07 ^b	0.18	0.0001
PCV (%)	29.40 ^a	29.03 ^a	27.35 ^b	25.57 ^c	24.23 ^d	0.49	0.0001
WBC(x10 ³ /ml)	4.15 ^a	4.07 ^a	3.72 ^b	3.49 ^c	3.11 ^d	0.08	0.0001
MCH (pg)	25.82 ^c	26.48 ^{bc}	26.36 ^{bc}	30.77 ^{ab}	31.66 ^a	2.22	0.0481
MCV (fl)	91.52 ^b	89.32 ^b	90.53 ^b	107.24 ^a	116.95 ^a	7.10	0.0042
MCHC (%)	28.22 ^{ab}	28.50 ^{ab}	29.46 ^a	28.45 ^{ab}	27.06 ^b	0.93	0.2047

Superscript abcd = Means within the same row having different superscripts are significantly different (P<0.05). Hb=Haemoglobin, RBC= Red blood cell, PCV= Packed cell volume, WBC= White blood cell, MCH=Mean corpuscular haemoglobin, MCV=Mean corpuscular volume, MCHC=Mean corpuscular haemoglobin concentration, CRT=Control, ACOSM= Autoclaved *Cassia obtusifolia* seed meal, BCOSM=Boiled *Cassia obtusifolia* seed meal, TCOSM= Toasted *Cassia obtusifolia* seed meal, WCOSM= Raw *Cassia obtusifolia* seed meal

Results and Discussion

Growth performance

The growth performance of broilers chickens fed control, raw and differently processed *Cassia Obtusifolia* seed meal is presented in Table 3. The overall weight gain for birds fed control diet (0% COSM) and T2 (ACOSM) were significantly (P< 0.05) higher than each of those fed T3 (BCOSM), T4 (TCOSM) and T5 (WCOSM) diets. The comparable values recorded in T1 (1962.00g)

and T2 (1945.80g) could probably imply that autoclaving method of treatment achieved optimum reduction the level of anti nutritional factors in the diets. This finding agrees with (12, 13) who found out that autoclaving gave best result when different treatment options were applied in detoxification of *Mucuna pruriens* and *Mucuna sloanie*. Birds fed on T5 diet (WCOSM) recorded the lowest overall weight gain of 1298 g, this is followed by 1531.00 g and 1740.60 g for T3 and T4

respectively, the observed decrease may be attributed to poor utilization of nutrient. This demonstrated that boiling and toasting methods of processing were not able to completely remove the anti nutritional factors in the diets. Similar study conducted (9) observed decline in final body weight when broilers were fed increased raw *Cassia obtusifolia* seed meal. Though no significant difference ($P>0.05$) was

observed among the treatment groups for feed intake, numerical difference was observed across the treatment groups. Birds fed on WCOSM (T5) had the lowest feed intake value of 95.33 g while T1, T2, T3 and T4 had 116.50, 114.50, 110.17 and 100.00 g respectively. The poor feed conversion ratio values recorded in T5 could probably be due to effects of anti nutritional factors in raw seeds.

Table 4: Serum biochemistry of broiler chicken fed differently processed *Cassia obtusifolia* seed meal.

Parameters	T1 0% CRT	T2 10% ACOSM	T3 10 % BCOSM	T4 10 % TCOSM	T5 10 % WCOSM	SEM	P. value
ALT (mmol/l)	7.0 ^b	6.5 ^b	3.25 ^d	4.80 ^c	12.00 ^a	0.51	0.0001
ALP (IU/L)	326.0 ^b	243.0 ^c	243.00 ^c	333.10 ^a	245.00 ^c	1.21	0.0001
AST (mmol/l)	60.00 ^c	62.00 ^b	62.00 ^b	71.00 ^a	70.00 ^a	0.73	0.0001
Bicarbon.(mmol/l	22.00 ^c	26.00 ^a	22.00 ^c	24.00 ^b	27.00 ^a	0.73	0.0001
Chloride(mmol/l)	101.00 ^c	102.00 ^b	105.00 ^a	100.00 ^c	103.00 ^b	0.65	0.0001
Cholesterol(mmol)	3.80 ^a	2.00 ^a	3.70 ^a	3.50 ^b	2.50 ^c	0.05	0.0001
Creatinine(mmol/l)	22.0 ^c	44.00 ^a	22.00 ^c	18.00 ^d	34.00 ^b	0.57	0.0001
Bilirubin (mmol/l)	2.80 ^c	3.70 ^d	11.60 ^b	15.10 ^a	8.20 ^c	0.12	0.0001
Globulin (g/dl)	2.00 ^a	1.90 ^a	1.70 ^{ab}	1.40 ^{bc}	1.20 ^c	0.27	0.0001
Glucose (mg/dl)	139.50 ^a	139.25 ^a	137.50 ^{ab}	131.75 ^{bc}	127.75 ^c	0.01	0.0077
Potassium(mmol/l)	3.80 ^c	4.80 ^b	4.40 ^b	3.80 ^c	5.00 ^b	0.01	0.0001
Protein (g/dl)	4.90 ^a	4.20 ^b	4.20 ^b	3.40 ^c	3.00 ^d	0.03	0.0001
Sodium (mmol/l)	136.00 ^c	141.50 ^a	140.00 ^{ab}	138.00 ^{bc}	142.00 ^a	0.42	0.0008
Urea (mmol/l)	1.90 ^c	2.00 ^b	1.80 ^d	1.50 ^c	2.17 ^a	0.02	0.0001

Superscripts abcde = Means within the same row having different superscripts differ significantly ($P<0.05$) ALT=Alkaline Amino transferase, ALP=Alkaline phosphate, AST=Aspartate Amino transferase , CRT=Control, ACOSM= Autoclaved *Cassia obtusifolia* seed meal, BCOSM=Boiled *Cassia obtusifolia* seed meal, TCOSM= Toasted *Cassia obtusifolia* seed meal, WCOSM= Raw *Cassia obtusifolia* seed meal.

Hematological indices

From the results (Table 4), the packed cell volume for birds fed T1 and T2 diets had similar values of 29.40% and 29.03%, these values are significantly higher ($P<0.05$) than each of those fed T3 (27.35%) and T4 (25.37%) diets. The packed cell volume 24.23% to 29.4 % recorded in this study was lower than the normal range values of 30 to 40 % reported (14). The lowest value of 24.23 % was recorded in birds fed on T5 diets. The reductions in packed cell volume (PCV) value in T5 WCOSM suggest presence of anti-

nutritional factors which had adverse effect on blood formation. This finding corroborates with earlier report of (15). The authors reported reduced packed cell volume values in broilers fed raw sorrel seed. The packed cell volume values recorded for various treatment groups in this study could be viewed as coefficient of efficiency of the various processing methods in reducing anti nutritional factors.

There was no significant difference ($P>0.05$) for hemoglobin (Hb) and Red Blood Cell (RBC) values recorded for broilers fed on

T1, T2 and T3 diets. These values however, differed significantly ($P < 0.05$) from those fed on T4 and T5 respectively. The Hb values of 8.0, 8.27 and 8.30g/dl for T3, T2 and T1 are within range values of 8 g/dl to 13 g/dl reported by (16). The lowest hemoglobin value of 6.42 g/dl was recorded in birds fed T5 (WCOSM) diets. The red blood cell values of 3.23 , 3.15 , and 3.05×10^6 /ml for T1, T2, and T3 recorded in this study is within the normal range of 2.88 to 4.12×10^6 /ml reported by (17) for domestic chickens. The significant ($P < 0.05$) decrease in red blood cell values and increase of MCH values of birds fed on T4 and T5 diets compared to control and other treatment groups implies that birds were not able utilize available nutrients. Reduction of RBC counts according to (18) indicates anaemia. This is in line with the report of (19) who observed decrease in packed cell volume; red blood cell, increase in mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC) values of broiler chickens fed processed *Jatropha curcas* kernel cake. The packed cell volume (PCV) and white blood Cell (WBC) values for T1 and T2 are similar but, differed significantly ($P < 0.05$) from those fed T4 and T5 diets.

There were significant differences ($P < 0.05$) in protein values for all the treatments groups except for birds fed on T2 (ACOSM) and T3 (BCOSM) which had similar values. The protein range values of (30 g/dl to 42 g/dl) obtained in this study was higher than the range values of 21.50 g/dl to 27.25 g/l obtained by (19) in broilers fed *Jatropha curcas* kernel

The serum cholesterol value were similar in birds fed T1, T2 and T3 diets but, were significantly ($P < 0.05$) higher than those fed diets T4 and T5. The 2.00 to 3.80 mmol/l range values for cholesterol obtained in this study were lower than 3.94 to 4.02 mmol/l reported (20). Bilirubin values 2.80, 3.70, 11.60, 15.10 and 8.20 mmol/l for T1, T2, T3, T4 and T5 recorded in this study differed

significantly ($P < 0.05$) among the treatment groups. Higher bilirubin levels recorded in T3, T4 and T5 implies that there may be an underlying problem involving the RBC or liver. The elevation of bilirubin is associated with haemolytic anaemia (18). The glucose values of 139.50mg/dl and 139.25mg/dl obtained for birds fed on T1 (control) and T2 autoclaved *Cassia obtusifolia* seed meal diets are significantly ($P < 0.05$) higher than those on T3, T4 and T5 diets. The values obtained in this study were lower than range of 142 g/dl to 185.97 g/dl for broilers (21).

Conclusion and Applications

1. Birds fed on *Cassia obtusifolia* seed meal processed by Autoclaving had comparable values in feed intake, final weight, hematological and serum biochemical indices with those fed on control diets and performed better than other treatment groups.
2. The comparable values recorded in T1 and T2 could probably imply that autoclaving method of treatment reduced the level of anti nutritional factors in the diets to a more tolerable level, thereby making the nutrients accessible to birds. However, in the event that farmers are not able to carry out autoclaving, boiling can be used as alternative.
3. The reduced performance index recorded for broilers fed raw *Cassia obtusifolia* seed meal T5 (WCOSM) is an indication of the presence of anti nutritional factors which affected utilization of the diets.

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