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Growth performance and hematological parameters of broiler chicken fed raw and boiled *senna obtusifolia* seed meal

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Target Audience: *Poultry farmers, Animal nutritionist, Researchers, Scientist*

Abstract

This study was conducted to determine the growth performance and hematological parameters of broiler chicken fed raw and boiled Senna obtusifolia seed meal. Three hundred (300) Ross day old chicks were used for this study. Chicks were randomly allotted to five treatment groups in a complete randomized design having three replicate with twenty birds each. Birds were housed in a deep litter system where water and feed was provided ad-libitum for eight weeks. Five experimental diets were formulated with inclusion of raw and boiled S. obtusifolia seed meal at two different levels 5% and 10% each for raw and boiled respectively. Diets were coded as T1(Control), T2(5% Raw S. obtusifolia seed meal), T3 (10% Raw S. obtusifolia seed meal), T4 (5% Boiled S. obtusifolia seed meal; (BSOSM first user define) and T5(10% Boiled Senna obtusifolia seed meal), respectively. Data collected from this study on growth performance and hematological parameters were analyzed using general linear model of SAS, 2009. Differences among means were separated using Duncan multiple range test. Result obtained from this study shows that there were significant (P<0.05) differences in final weight, weight gain, feed conversion ratio and feed cost/kg gain across treatment groups at the starter and finisher phases. On the other hand, there was no significant (P > 0.05) difference recorded on feed intake, mortality record and all the hematological parameters measured. Birds fed 5% BSOSM had increased weight gain at the starter phase and improved feed conversion ratio in the finisher phase than other treatment groups. Also, birds fed control diet had increased weight gain at the finisher phase and improved feed conversion ratio in the starter phase than other treatment groups. Hematological parameters obtained in this study revealed that there were no significant (p > 0.05) differences across treatment groups. This implies that S. obtusifolia seed meal is safe for feeding broiler birds either raw or boiled with inclusion levels of up to 10% without any adverse effect on the performance.

Key words: *Growth performance, hematology, broiler chicken, Senna obtusifolia, Ross breed.*

Description of Problem

In the past, poultry farming involved raising chickens in the back yard for daily egg production and family consumption (1). However, poultry farming today is a huge business that is splited into several operations including hatcheries, broiler farms for meat production, or pullet farms for egg production. (2) stated that successful broiler production is dependents upon supplying the birds with feed of the highest quality, in terms of ingredients used, processing procedures applied and finally the form in which the feed is presented to the birds. As cereal products are increasingly used as feeds for animals, its share is projected to reach nearly 45-50% by 2050 in the world (3). (4) reported that the competition between food, feed and agro-fuels is expected to aggravate prices of poultry feeds that enforce producers to look for alternative and locally available feed sources. One of such feed is *Senna obtusifolia* commonly called

'sickle pod'. This plant mostly grows in the wild and can cover an extensive useful farm land area as weed, thereby making farm lands either a waste or more costly to cultivate. However, the amount of antinutritional factors in the seed limits it use in livestock feeding. The chemical composition of the seeds as revealed by (5) and (6) indicated that they have good nutritional properties (29.54 and 23.40% crude protein) but also contain antinutritional factors (tannins 388.50 mg/100g, phytates 240.50 mg/100g and oxalate 83.25 mg/100g) which may adversely affect blood constituents and general performance of chicken. Components of blood hematology are valuable in monitoring feed toxicity especially with feed constituents that affect the blood as well as the health status of farm animals (7). Therefore, the aim of this study was to determine the effect of feeding raw and boiled *Senna obtusifolia* seed meal on the growth performance and hematological parameters of broiler chicken.

Materials and Method

Experiment site

This study was carried out at the Poultry Unit in the Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria. Zaria is located on latitude 11˚11' N and longitude 07˚38' E. It is situated at an altitude of 686m above sea level. The mean maximum temperature varies between 26˚C to 35˚C depending on the season, while the mean relative humidity during the wet and dry (harmattan) seasons are 72% and 21% respectively (8). The area has an average annual rainfall of 1080mm as reported by (9).

Source of Senna obtusifolia seed and processing methods

The matured seeds of *Senna obtusifolia* were harvested in Zaria. Harvesting of these matured seeds was done at the onset of dry season, around November-January. Two processing methods (boiling and fermentation) were used to determine the effect of processing *Senna obtusifolia* seed on performance of broiler chicken. Boiling was done for 30 minutes, while fermentation process was for 48 hours and this was induced with rumen liquor obtained from an abattoir in Zaria.

Boiling method was use for processing of *Senna obtusifolia* seed.

Every 100g of *Senna obtusifolia* seed was boiled for 30 minutes in 1 liter of water that has already reached its boiling point. These boiled seeds was drained of water and dried under the sun then milled using a hammer mill. Samples were taken to Department of Animal Science Biochemical laboratory, Ahmadu Bello University to determine the effect of boiling on chemical composition and some anti-nutritional factors of *Senna obtusifolia* seed meal using the procedure described by (10).

Experimental design, Experiment diets and management of birds

Three hundred (300) Ross day old chicks were used for this study. Chicks were randomly allotted to five dietary treatments in a completely randomized design consisting of three replicate per treatment with twenty birds in each replicate. The experimental diets were assigned to birds with treatment 1 serving as control without *Senna obtusifolia* while treatments 2, 3, 4 and 5 were supplemented with 5% RSOSM, 10% RSOSM, 5% BSOSM and 10% BSOSM per 100Kg of diet at both starter and finisher phases respectively. The experimental diets were formulated to meet the standard requirements using recommendations of NRC (11) as shown in Tables 1 and 2.

Table 1: Composition of Broiler starter diets containing graded levels of raw and boiled *Senna obtusifolia* seed

Ingredients	0%	5% RSOSM	10% RSOSM	5% BSOSM	10% BSOSM
Maize	56.45	53.40	50.35	53.40	50.35
Soyabean cake	29.50	27.55	25.60	27.55	25.60
Groundnut cake	10.00	10.00	10.00	10.00	10.00
SOS	0.00	5.00	10.00	5.00	10.00
Bone meal	2.80	2.80	2.80	2.80	2.80
Lime stone	0.50	0.50	0.50	0.50	0.50
Salt	0.25	0.25	0.25	0.25	0.25
Premix*	0.25	0.25	0.25	0.25	0.25
Lysine	0.05	0.05	0.05	0.05	0.05
Methionine	0.20	0.20	0.20	0.20	0.20
Total	100	100	100	100	100
Calculated analysis					
ME(Kcal/kg)	2908	2900	2900	2900	2900
Crude protein (%)	23.12	23.00	23.00	23.00	23.00
Crude fibre (%)	3.59	4.11	4.68	4.04	4.53
Ether extract (%)	3.16	3.99	4.09	3.95	4.01
Calcium (%)	1.25	1.26	1.26	1.26	1.26
Phosphorus (%)	0.84	0.83	0.82	0.83	0.82
Lysine (%)	1.40	1.34	1.27	1.34	1.27
Methionine + Cysteine (%)	0.89	0.84	0.81	0.86	0.82
Feed Cost /kg diet (₦)	180.38	172.98	165.05	173.64	166.38

SOS = Senna obtusifolia seed. RSOSM = Raw *Senna obtusifolia* Seed Meal, BSOSM=Boiled *Senna obtusifolia* Seed Meal,

*=Biomix premix supplied per kg of diet: Vit. A,10,000iu; Vit. D_3, 2000iu; Vit.E, 23mg; Vit. K, 2mg; Vit.B_1,1.8mg; Vit. B_2, 5.5mg; Niacin, 27.5mg; Pantothenic acid, 7.5mg; Vit. B_{12}, 0.015mg; Folic acid, 0.75mg; Biotin, 0.06mg; Choline chloride, 3000mg; Cobalt, 0.2mg; Copper, 3mg; Iodine, 1mg; Iron, 20mg; Manganese, 40mg; Selenium, 0.2mg; Zinc, 30mg; Antioxidant, 1.25mg

Table 2: Composition of Broiler finisher diets containing graded levels of raw and boiled *Senna obtusifolia* seed

Ingredients	0%	5% RSOSM	10% RSOSM	5% BSOSM	10% BSOSM
Maize	59.00	56.00	53.50	56.00	53.50
Maize offal	6.00	6.00	5.00	6.00	5.00
Soyabean cake	20.00	19.00	17.50	19.00	17.50
Groundnut cake	10.00	10.00	10.00	10.00	10.00
SOS	0.00	5.00	10.00	5.00	10.00
Bone meal	2.60	2.60	2.60	2.60	2.60
Lime stone	0.50	0.50	0.50	0.50	0.50
Salt	0.25	0.25	0.25	0.25	0.25
Premix*	0.25	0.25	0.25	0.25	0.25
Lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20
Total	100	100	100	100	100
Calculated analysis					
ME(Kcal/kg)	2948	2933	2922	2931	2921
Crude protein (%)	20.28	20.12	20.12	20.17	20.15
Crude fibre (%)	3.96	3.82	3.59	3.87	3.60
Ether extract (%)	3.18	3.05	2.94	3.05	2.93
Calcium (%)	1.18	1.19	1.19	1.19	1.19
Phosphorus (%)	0.81	0.80	0.79	0.80	0.79
Lysine (%)	1.30	1.23	1.18	1.23	1.18
Methionine+ Cysteine (%)	0.82	0.79	0.76	0.79	0.76
Feed Cost /kg diet (N)	153.76	150.31	145.89	150.98	147.22

SOS = Senna obtusifolia seed. RSOSM = Raw *Senna obtusifolia* Seed Meal, BSOSM=Boiled *Senna obtusifolia* Seed Meal, *=Biomix premix supplied per kg of diet: Vit. A,10,000iu; Vit. D_3, 2000iu; Vit.E, 23mg; Vit. K, 2mg; Vit.B_1,1.8mg; Vit. B_2, 5.5mg; Niacin, 27.5mg; Pantothenic acid, 7.5mg; Vit. B_{12}, 0.015mg; Folic acid, 0.75mg; Biotin, 0.06mg; Choline chloride, 3000mg; Cobalt, 0.2mg; Copper, 3mg; Iodine, 1mg; Iron, 20 mg; Manganese, 40mg; Selenium, 0.2mg; Zinc, 30mg; Antioxidant, 1.25mg

Growth study

Birds were weighed at the beginning of the experiment and thereafter weighing was done weekly. Data were collected on initial weight, final weight, weight gain, feed intake, feed conversion ratio, cost of feed per kilogram weight gain, feed cost per kilogram and mortality was recorded as it occurred.

Hematological study

Two (2) ml of blood was collected from each bird through wing web using syringe and needle. Blood samples were collected into sterile bottles containing Ethylene Di-amineTetra Acetic Acids (EDTA) as anti-coagulant and taken to Clinical Pathology Laboratory, Faculty of Medicine, Ahmadu Bello University, Zaria for determination of packed cell volume, lymphocyte count, Red blood cell, neutrophills, eosinophil, hemoglobin and white blood cell using the procedure of (12).

Statistical analysis

Data generated from this study were subjected to Analysis of Variance using the General Linear Model of Statistical Analysis System (13). Differences between treatment means were separated using Duncan Multiple Range Test (14)

Table 3: Performance of starter broiler chicken fed graded levels of boiled *Senna obtusifolia* seed (0-4 weeks)

Parameters	0%	5% RSOSM	10% RSOSM	5% BSOSM	10% BSOSM	SEM	LOS
Initial weight (g/bird)	44.70	44.70	45.45	45.45	44.70	1.02	NS
Final weight (g/bird)	765.15^{ab}	727.27^{b}	643.94^{c}	818.18^{a}	734.85^{b}	21.16	*
Weight gain (g)	720.45^{ab}	682.58^{b}	598.48^{c}	772.73^{a}	690.15^{b}	21.26	*
Daily weight gain (g/bird)	25.73^{ab}	24.38^{b}	21.37^{c}	27.60^{a}	24.65^{b}	0.76	*
Feed intake (g)	1263.64	1344.70	1400.00	1410.61	1392.42	48.81	NS
Daily feed intake (g/day)	45.13	48.03	50.00	50.38	49.73	1.74	NS
Feed conversion ratio	1.75^{a}	1.97^{ab}	2.34^{c}	1.83^{ab}	2.02^{b}	0.07	*
Feed Cost/kg gain (₦)	253.73^{a}	277.12^{a}	318.91^{b}	260.09^{a}	278.78^{a}	9.57	*
Mortality rate (%)	0.00	0.67	0.33	0.33	0.33	0.30	NS

a, b, c means with different superscript on same column are significantly (P<0.05) different, RSOSM = Raw *Senna obtusifolia* Seed Meal, BSOSM=Boiled *Senna obtusifolia* Seed Meal,SEM=Standard Error of Means, LOS=Level of Significance, NS=Not Significant, *=Significant.

Table 4: Performance of finisher broiler fed graded levels of boiled *Senna obtusifolia* seed

Parameters	0%	5% RSOSM	10% RSOSM	5% BSOSM	10% BSOSM	SEM	LOS
Initial weight (g/bird)	777.78	777.78	775.93	777.78	775.93	1.17	NS
Final weight (g/bird)	2388.89^{a}	2111.11^{bc}	2037.04^{c}	2351.85^{a}	2222.22^{b}	39.72	*
Total weight gain (g)	1611.11^{a}	1333.33^{bc}	1268.52^{c}	1574.07^{a}	1453.70^{b}	39.17	*
Daily weight gain (g/bird)	57.54^{a}	47.62^{bc}	45.30^{c}	56.22^{a}	51.92^{b}	1.40	*
Total feed intake (g)	4058.30	3768.50	3789.80	3913.90	3842.60	125.00	NS
Daily feed intake (g/day)	144.94	134.59	135.35	139.78	137.24	4.46	NS
Feed conversion ratio	2.52^{ab}	2.83^{bc}	2.98^{c}	2.49^{a}	2.65^{ab}	0.10	*
Feed Cost/kg gain (₦)	355.71^{ab}	388.58^{ab}	398.96^{b}	346.15^{a}	358.74^{ab}	13.80	*
Mortality rate (%)	0.00	0.00	0.00	0.00	1.00	0.45	NS

a, b, c means with different superscript on same column are significantly (P<0.05) different, RSOSM = Raw *Senna obtusifolia* seed meal, BSOSM=Boiled *Senna obtusifolia* seed meal, SEM=Standard Error of Means, LOS=Level of Significance, NS=Not Significant, *=Significant.

Table 5: Effect of boiled *Senna obtusifolia* seed on the haematological parameters of finisher broiler birds.

Parameters	0%	5% RSOSM	10% RSOSM	5% BSOSM	10% BSOSM	SEM	LOS
Packed Cell Volume (%)	28.10	28.47	26.43	28.80	28.40	1.06	NS
Red Blood Cell (x10^{12}/L)	2.19	2.23	2.05	2.25	2.24	9219.08	NS
White Blood Cell (x10^{9}/dl)	2.43	2.47	2.43	2.42	2.42	3921.29	NS
Haemoglobin conc. (%)	9.17	9.35	8.50	9.35	9.50	0.39	NS
Neutrophills (%)	1.43	1.65	2.17	1.45	1.90	0.21	NS
Lymphocytes (%)	97.33	97.35	96.67	97.60	97.15	0.36	NS
Eosinophil (%)	0.45	0.20	0.67	0.30	0.25	0.21	NS
Monophil	0.90	0.80	1.63	0.65	0.65	0.43	NS
Basophil	0.05	0.00	0.13	0.00	0.00	0.03	NS

RSOSM= Raw *Senna obtusifolia* Seed Meal, BSOSM=Boiled *Senna obtusifolia* Seed Meal, SEM= Standard Error of Means, LOS=Level of Significance, NS=Not Significant.

Results and Discussion

Results on performance of broiler starter chicken fed boiled *Senna obtusifolia* seed are shown in Table 3 Results obtained in this study reveals that feeding raw and boiled *Senna obtusifolia* seed meal in the diet of broiler birds had significant (P<0.05) difference on final weight, weight gain, feed conversion ratio and feed cost/kg gain. This result does not agree with the report of (6) who reported no significant differences in performance of broiler chickens fed with processed *Senna obtusifolia* seed meal. Birds fed 5% boiled *Senna obtusifolia* seed meal had the highest weight final weight (818.18g) and weight gain (772.73g) compared to the control and other treatment groups. There was improved feed conversion ratio (1.75) and lower feed cost/kg gain, (253.73) in birds fed the control diet. Broiler fed diets containing 5% raw *Senna obtusifolia* seed meal (RSOSM), 5% boiled *Senna obtusifolia* seed meal (BSOSM) had no significant (P > 0.05) difference in all parameters measured on growth performance when compared with birds fed the control diet. On the other hand birds fed 10% RSOSM had significant (P < 0.05) differences recorded on final weight gain, total weight gain, feed conversion ratio and feed cost per kg gain in comparison with birds fed the control diet, except for feed intake and mortality records of birds fed 10% RSOSM which showed no significant (p > 0.05) in comparison with those fed on control diet. Mortality was not recorded in this phase of the study. Birds fed 10% RSOSM had the lowest final weight and weight gain. This agrees with the report of (15) who reported that birds fed up to 10% RSOSM had poor performance in terms of body weight and weight gain. Birds fed 5% BSOSM showed a better response with higher values (818.18g and 772.73g, respectively, obtained in final weight and total weight gained. Also these birds recorded lower feed conversion ratio (1.83) and feed cost per kg gain 369.09 better than those fed 5% RSOSM, 10%RSOSM and 10%BSOSM. However, birds fed the control diet had the best feed conversion ratio (1.75) and feed cost per kg gain (253.73) than other treatment groups.

Results on the performance at finisher phase (4-8 weeks) of chicken fed boiled *Senna obtusifolia* seed are shown in Table 4. Birds fed 5% and 10% BSOSM showed significant (P < 0.05) differences in all growth parameters measured compared to the control diet. On the other hand, birds fed 5% and 10% RSOSM recorded significant (P < 0.05) differences in final weight and weight gain. However, there were no significant (p>0.05) differences in feed intake, feed cost per kg gain and mortality when compared with control group. Birds fed 0%(control diet) *S. obtusifolia* seed meal had better results on growth performance than those feed diets with inclusion of *S. obtusifolia* seed meal at 5% RSOSM, 10% RSOSM and 5% BSOSM, 10%BSOSM respectively. Feed cost per Kg gain recorded in this phase was lowest for birds fed 10% RSOSM (2.98) and best for birds fed 5% BSOSM. This results agrees or disagree nevertheless, FI was seen to have been lower for birds fed 10% RSOSM than birds fed 10% RSOSM, 5% and 10% BSOSM compared with the control diet.

Mortality was recorded only in birds fed 10% BSOSM. Birds fed 10% RSOSM recorded reduce feed efficiency and reduce growth rate compare to other treatment containing *Senna obtusifolia* and even the control. This may be as a result higher amount of saponin which tends to bind the cell of small intestine thereby affecting the absorption of nutrients across the intestine wall. This is in agreement with the findings of (16) who reported that high amount of saponin in plant reduce feed efficiency and reduce growth rate. The FI was highest in birds fed 5% BSOSM (3768.50g) followed by 10% RSOSM (3789.80g) and 10% BSOSM (3842.60g), respectively. Although, birds fed the control

diet had overall highest FI value. Therefore, in this study, FI was depressed with inclusion of 5% RSOSM, 10%RSOSM, 5%BSOM and 10% BSOSM compared to those fed the controlled diet. This result is similar with the findings of (15) who reported depressed feed intake of broiler fed *Cassia obtusifolia* with inclusion level of up to 3%.

Table 5 shows the result on the effect of raw and boiled *Senna obtusifolia* seed meal on the haematological parameters of broiler birds at eight weeks. Results obtained in this study revealed that there were no significant ($p > 0.05$) differences for all the blood parameters across treatment groups. This implies that *Senna obtusifolia* seed meal is safe for feeding broiler birds either raw or boiled with inclusion levels of up to 10% without any effect on the blood parameters. The values of PVC (28.10, 28.47, 26.43, 28.80, 28.40), RBC (2.19, 2.23, 2.05, 2.25, 2.24) and Hb (9.17, 9.35, 8.50, 9.35,9.50 respectively) obtained in this study fall within the normal haemotological range of values for PCV (25-45) RBC (2-4) and Hb (7-13) of chicken as reported by (16). This result agrees with the earlier report of (6) who stated that the values of PCV, RBC and Hb obtained in his study fell within the normal range. The WBC obtained in this study falls below the normal range as reported (16). The decreased in WBC indicates low immune response and could lead to inability of birds to protect their body against pathogens. This could be attributed to the residual effect of antinutritional factors present in the test material used in this study. The RBC values in this study were lower than the $3.3x10^6mm^3$ reported by (17).

Conclusion and Application

1. Generally, growth performance of birds fed raw and boiled *Senna obtusifolia* seed meal were significantly ($p < 0.05$) different across treatment groups.
2. Birds fed 5% BSOSM had improved performance than those fed control and raw *Senna obtusifolia* seed meal.
3. Haematological parameters measured in this study of birds fed raw and boiled *Senna obtusifolia* seed meal were not different ($p>0.05$) compared to those on control diet.
4. It can be concluded that inclusion of *Senna obtusifolia* seed meal at 10% irrespective of processing is safe for broiler feeding without any adverse effect on growth performance and haematological parameters.

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