GROWTH PERFORMANCE AND MEAT QUALITIES OF WEANER RABBITS FED GRADED LEVELS OF BOILED NEGRO COFFEE (*Senna occidentalis*) SEED MEAL.

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ABSTRACT
A twelve (12) weeks feeding trial was carried out to determine the growth performance and meat qualities of weaner rabbits fed graded levels of boiled Senna occidentalis seed meal(BSOM). A total of five (5) experimental diets were formulated to include BSOM at inclusion levels of 0, 2.5, 5, 7.5 and 10% respectively. Forty five (45) weaner rabbits of mixed breeds and sexes were randomly apportioned to five (5) dietary treatments in a completely randomized design (CRD. The result obtained for average weekly feed intake showed significant difference (P<0.05) between treatments with reduced feed intake as levels of BSOM increases across all the groups. The average weekly weight gain indicated significant difference (P<0.05) among treatments and increases as inclusions of BSOM increases up to 07.50 % inclusion level and decreases at 10.00 % inclusion level. Feed conversion ratio (FCR) tends to increase as inclusion levels of BSOM increase. Significant difference (P<0.05) were also observed in the protein efficiency ratio (PER) and Energy efficiency ratio (EER). All parameters evaluated for meat quality; water holding capacity (WHC), meat pH, cooking yield (Cy) and cooking loss (Cl), indicated significant difference. The better result in terms of weight gain, FCR and meat qualities were obtained in diet 4 containing 07.50 % BSOM. As regards to these findings, it was concluded that 07.50 % BSOM can be included in the diets of growing rabbits without any deleterious effect.
Key words: rabbits, *Senna occidentalis*, boiling, growth performance, meat qualities.

INTRODUCTION
The search for novel high quality but cheap sources of protein and energy has continued to be major point of concern for scientists and organization charged with the responsibility for food production in many parts of the world (Kudu *et al*., 2010). The high cost of conventional feedstuffs like soybean meal(SBM), groundnut cake (GNC), fish meal, maize e.t.c has prompted researches on the possible use of non-conventional feedstuffs of high nutritive value, cheaper and readily availble like Negro coffee (*Senna occidentalis*) seeds in livestock feeds formulations. *Senna* species have been widely used by American, African and Indian ethnic groups mainly in the treatment of feebleness, constipation, liver disorders and skin infections (Jesus *et al*., 2015) . However, because of inadequate information about its nutritional qualities and the presence of anti-nutritional factors (ANFs), the utilization of Negro coffee is limited (Abdullahi *et al.*, 2003). This study was carried out to determine the effects of boiled *Senna occidentalis* seed meal (BSOM) on the growth performance and some meat quality parameters.

MATERIALS AND METHODS
Experimental site
The experiment was carried out in the Rabbit unit at the Federal University of Technology Minna, Gidan Kwano Campus, Minna, Niger State, Nigeria. Minna is located within latitude 09° 36' 50" N and longitude 06° 33' 25" E, degrees minutes' seconds respectively (MINNA NIGER GEOGRAPHY, 2004 - 2017).
Sample collection and processing
Dried pods of Negro coffee were harvested from mature stands of Negro coffee herb along Minna- Bida road, Niger State, Nigeria. The pods were threshed to obtain the raw Negro coffee seeds (RSOS). The seeds were cleaned of undesirable materials like husks, sand, leaves and underdeveloped seeds. All selected seeds were boiled using the method described by Omoikhoje *et al*. (2009) by subjecting seeds to boiling at temperatue of 100^{o}C for 60 minutes. The boiled seeds were poured into a sieve and allowed to drain and

later sun dried. After drying, the seeds were milled using milling machine into coarse sized particles and stored in an air tight container and labelled boiled *Senna occidentalis* seed meal (BSOM). Forty five (45) weaner rabbits were purchased from the Ministry of Livestock and Fisheries, Minna, Niger State, Nigeria.

Anti-nutritional factors (ANFs) analysis of RSOS and BSOM: ANFs of the raw Negro coffee seeds (RSOS) and the boiled *Senna occidentalis* seeds (BSOS) were determined at National Cereal Research Institute (NCRI), Badeggi, Niger State, Nigeria. The parameters mesured are; tanin content, phytate content, cynide content, saponin content and trypsin inhibitor.

Experimental diet and management of experimental animal: The experimental diets were formulated in line with Aduku (1993) for weaner rabbits. The ground BSOS was mixed into rations at inclusion levels of 0.00, 2.50, 5.00, 7.50 and 10.00% designated as T_1, T_2,T_3,T_4 and T_5 respectively. Diet which contained 0.00% BSOM was served as the control diet. Everyday, the remaining feed in the feeders were collected and weighed in order to obtain their daily feed intake and the average of these over a period of sven days was taken as the avarage daily feed intake. Water was made available to all rabbits *ad-libitum*.

Experimental design: The Completely randomized design (CRD) was used. The hutches were ramdomly labelled with each hutch representing a replicate of a treatment and a total of fifteen (15) hutches.

RESULT AND DISCUSSION

Table 1 shows the result for anti-nutritional factors (ANFs) analysis of RSOS and BSOM, it indicated percentage reduction in the levels of ANFs after boiling, the result indicated 24.74 % reduction for saponin which is the lowest reduction, while phytate, trypsin inhibitor, cyanide and tannin has percentage reductions of 35.90 %, 56.86 %, 61.41 % and 78.38 %, respectively. Kudu (2014) reported similar findings. The proximate composition and calculated energy content of RSOM and BSOM is presented in Table 2, however, only the boiled seeds were used for the experiment. The result showed that crude protein, crude fibre, ether extract and ash content of the raw seeds were increased when seeds were boiled, and only nitrogen free extract (NFE), calculated energy (kcal/kg) and moisture content of the raw seeds were reduced after been boiled. The feed composition of the experimental diets and calculated energy are show in Table 3.The crude protein ranges from 17.99% in T2 to 18.09% in T4.

The growth performance records are shown in Table 4, average feed intake indicated significant differences ($p<0.05$) between treatments for all the weeks with the values decreasing with increasing level of BSOM in the diets. The feed conversion ratio also followed similar trend with significant differences observed among all the treatments throughout the experiment except for weeks 4, 5 and 8. Midala *et al*. (2013) reported decrease in feed intake and feed conversion ratio (FCR) with higher levels of *senna* in the diets. This could be as a result of higher residual effects of anti-nutritional factors.

Table 5 shows the analysed result of meat quality parameters. All parameters for meat quality showed significant difference ($P<0.05$). The highest values for WHC (41.22), meat pH (5.53) and Cy (68.46) were recorded at T5 while, for Cl (43.76) was recorded for T2. The values recorded at T5 for WHC indicated the meats of rabbits in the group are juicier.

CONCLUSION

From the result of this experiment, it was concluded that for most of the parameters measured; feed intake, body weight gain, feed conversion ratio on weekly basis, on the performance of rabbits, T4 which has an inclusion level of 07.50 % BSOM performed best in average weekly weight gain while, T5 which has an inclusion level of 10.00 % BSOM performed poorest. For parameters considered for meat quality, T5 with 10.00 % inclusion of BSOM performed best in WHC considered while T2 with 02.50 % inclusion of BSOM has the highest value in Cl.

Table 1: Anti-nutritional factors (ANFs) of raw and boiled *Senna occidentalis* seeds

Anti-nutritional factors	Raw	Boiled	% Reduction
Cyanide (mg/100g)	18.30	7.06	61.42
Phytate (mg/100g)	518.25	332.18	35.90

Tannin (g/kg)	25.86	5.59	78.38
Saponin (mg/100g)	32.10	24.16	24.74
Trypsin inhibitor (g/kg)	35.72	15.41	56.86

Table 2: Proximate composition and calculated energy contents of RSOS and boiled *Senna occidentalis* seeds (BSOM)

Parameters (%)	Raw	Boiled
Dry matter	90.80	92.55
Crude protein	20.31	21.72
Crude fibre	13.74	13.88
Ether extract	7.46	7.48
Ash	3.74	4.32
NFE	45.55	44.65
Moisture	9.20	7.45
Calculated energy (kcal/kg)	3500.00	3350.00

*NFE: Nitrogen Free Extract

Table 4: Growth performance of weaner rabbits fed graded levels of pelleted boiled *Senna occidentalis* seed meal

	T1	T2	T3	T4	T5	SEM	LS
Parameters	0.00	2.50	5.00	7.50	10.00		
Init. body weight (g)	546.67^{a}	548.33^{a}	548.33^{a}	548.33^{a}	546.67^{a}	20.35	NS
Final body weight (g)	1175.00^{bc}	1200.00^{bc}	1410.00^{ab}	1550.00^{a}	1053.30^{c}	119.42	**
Av.d.body wt gain (g)	7.48^{bc}	7.66^{bc}	10.26^{ab}	11.94^{a}	6.03^{c}	1.40	**
Av.d. feed intake (g)	56.50^{a}	53.34^{b}	45.51^{c}	43.93^{c}	40.48^{d}	0.97	**
FCR	7.88^{c}	6.96^{bc}	4.47^{ab}	3.78^{a}	7.20^{c}	1.16	**

Av.d =Average daily, FCR=Feed conversion ratio, Init = Initial weight, abc = means with different letters show significant difference ($p<0.05$)

Table 5: Meat quality parameters

Parameters	T1	T2	T3	T4	T5	SEM	LS
WHC	32.65^{c}	37.55^{b}	30.12^{c}	24.35^{d}	41.22^{a}	1.16	*
Meat pH	5.49^{a}	5.02^{b}	5.13^{b}	5.11^{b}	5.53^{a}	0.14	*
Cy	59.90^{b}	56.24^{c}	62.16^{b}	60.85^{b}	68.46^{a}	1.38	*
Cl	40.08^{b}	43.76^{a}	36.84^{c}	39.15^{bc}	31.54^{d}	1.25	*

a, b, c, d = Means with the same letter are not significantly different (P>0.05), Means with different letters (a, b, c, d) differ significantly (P<0.05), SEM: Standard error mean, LS: level of significance, *: Significant difference, BSOM: Boiled *Senna occidentalis* seed meal, T1: 00.00% BSOM, T2: 02.50% BSOM, T3: 05.00% BSOM, T4: 07.50% BSOM, T5: 10.00% BSOM, WHC: Water holding capacity, pH: Meat pH, Cy: Cooking yield, Cl: Cooking loss.

Table 3.1 Percentage composition of experimental diets

Ingredients	T1	T2	T3	T4	T5
Maize	36.00	36.50	37.00	37.00	37.50
Soyabean	27.00	25.00	24.00	24.00	20.00
Blood meal	2.45	2.45	2.45	2.50	2.00
BSOM	0.00	2.50	5.00	7.50	10.00

Rice offal	18.00	17.00	18.00	16.45	17.95
Maize offal	13.00	13.00	10.00	9.00	9.00
Bone meal	2.50	2.50	2.50	2.50	2.50
*Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.40	0.40	0.40	0.40	0.40
Methionine	0.20	0.20	0.20	0.20	0.20
Lysine	0.20	0.20	0.20	0.20	0.20
Total	100	100	100	100	100
Calculated analysis					
Crude protein (%)	18.05	17.99	18.08	18.09	18.00
Calculated energy (kcal/kg)	2992.17	3000.05	3002.63	3002.78	3017.26
Crude fibre	12.23	12.21	11.74	10.87	11.32
Calcium	1.16	0.98	1.13	1.02	0.94
Phosphorus	0.62	0.57	0.61	0.58	0.53

*To provide the following per 100 kg of the diet: 440 mg riboflavin, 720 mg calcium, 2 g pantothenate, 2 g niacin, 2.2 g chloride, 15 mg folic acid, 1mg vitamin B12, 15 mg retinol, 165 g vitamin D2, 1,000 mg DL-tocopherol acetate, 1,700 mg copper, 200 mg iodide, 3,000 mg manganese, 5,000 mg zinc, 10, 000mg iron.

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