



Original article

GROWTH PERFORMANCE, NUTRIENT DIGESTIBILITY AND CARCASS TRAITS OF WEANER RABBITS (*Oryctolagus cuniculus*) FED DIETS CONTAINING PELLETTED BOILED NEGRO COFFEE (*Senna occidentalis*) SEED MEAL

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ABSTRACT

A 12-week feeding trial was conducted to determine the growth performance, nutrient digestibility and carcass traits of weaner rabbits fed diets containing pelleted boiled *Senna occidentalis* seed meal. A total of 45 weaner rabbits of mixed sexes were randomly allotted to five treatment diets, in a completely randomized design model, with three replicates per treatment and three rabbits per replicate, making a total of nine rabbits per treatment. Boiled and pelleted *Senna occidentalis* seed meals were included in the diets at the levels of 0 %, 2.5 %, 5 %, 7.5 % and 10 % respectively. Feed and water were supplied to the animals *ad libitum*, and data collected on growth performance. At the end of the feeding trial, one animal per replicate was randomly selected, fasted for about 12 hours, and slaughtered using a sharp knife at the jugular vein. Results showed significant differences ($p < 0.05$) in feed intake and feed conversion ratio; and they decreased linearly with increasing levels of *Senna* in the diet. Weekly weight gain was highest in Treatment 4 (7.5 % boiled pelleted *Senna*) from the fourth week till the end of the experiment (11.94 g/day), while Treatment 5 (10% *Senna*) recorded the lowest weight gain (6.03 g/day) throughout the experiment. Treatment 1 had the highest digestibility values for crude protein and ether extract (82.74 and 77.39 % respectively) while Treatment 4 had the highest value for crude fibre, digestibility (78.66 %) although significant variations ($p < 0.05$) occurred among all the parameters taken. Also, significant differences ($p < 0.05$) occurred in the live weight, slaughter weight and dressed weight among the various treatments. Better performance parameters were obtained in Treatment 4 indicating that up to 7.5 % pelleted boiled *Senna occidentalis* seed meal can be included in the diets of growing rabbits without any adverse effects on their growth performance and carcass traits.

Keywords: Pelleted boiled *Senna occidentalis* seed meal, growth performance, carcass traits, weaner rabbits.

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INTRODUCTION

Rabbit production is becoming more attractive among the tropical farmers because of its numerous desirable traits which include: ability to convert plant feed materials into high quality protein, high growth rate (when compared to other livestock like goat, sheep, pig and cattle), high fecundity, short generation interval, good source of organic manure for farmers and high adaptability to varying climatic extremes among others [1].

The cost of the conventional feed stuffs have continued to increase tremendously in recent times, and as livestock production continues to increase to meet the growing population of the world, the availability of these conventional feed stuffs is often fickle. This challenge has been worsened by the rising competition between man and livestock for these conventional feedstuffs [2]. Feed forms the most important component in livestock production and if not provided in the right quality and quantity, the amount and quality of livestock products will reduce and there will be limited supply of animal protein to meet the human needs. Non-conventional feedstuffs generally refer to those feed stuffs that are not traditionally used for feeding livestock and are not used commercially to produce animal feeds. Several known examples of these feedstuffs include palm leaf meals, palm press fibre, seeds and leaves of *Gmelina arborea* (Gmelina), cassava foliage and Negro coffee. The objective of this study is to determine the potentials of *Senna occidentalis* (Negro coffee) as feedstuff on the growth performance and carcass traits of rabbits. [3] reported that the use of Negro coffee is limited due to poor information on its nutritional values and the presence of anti-nutritional factors such as phytates, cyanide, saponnins,

trypsin inhibitor, tannins and anthroquinones, coupled with its pungent smell.

MATERIALS AND METHODS

Forty-five (45) mixed sex rabbits were used for this study. The *Senna occidentalis* seeds were harvested from the matured shrub stands in the wild along Minna-Bida road. *Senna* pods collected were well dried and threshed to get the seeds which were then winnowed and cleaned to remove dirt. The cleaned seeds were then boiled using the method described by [4] which was adopted by [5]; the seeds were subjected to boiling at 100^o C for 60 minutes and then removed and dried. The boiled dried seeds were milled using hammer mill to get a fine texture and was labelled boiled *Senna occidentalis* seed meal (BSOSM) and then stored. Anti-nutritional factors such as cyanide, tannin content, saponnin, phytic acid, trypsin inhibitor activity of both boiled and raw *Senna* seeds were determined at the National Cereals Research Institute, Badeggi using the methods of [6]. Formulated feeds were pelleted using pelleting machine of 2 mm screen size to prevent waste of feed during feeding. Feed and clean drinking water were served to the animals kept in standard wooden rabbit cages *ad-libitum*. Data were collected on daily feed intake. The experimental animals were weighed at the beginning of the experiment; and were weighed weekly thereafter to obtain weekly weight gain. At the end of the 11th week of the experiment, a nutrient digestibility trial was carried out and faecal samples were collected using the total collection method. Proximate analyses of the feed and faecal samples were carried out using the standard analytical procedures of [7] to determine

the quantity of nutrients in the feed and faeces. From these data, the coefficients of nutrients digestibility were determined

RESULTS AND DISCUSSION

Table 1 shows the effects of boiling on the anti-nutritional factors present in the raw seeds. Tannins recorded the highest percentage reduction of 78.38%, while saponin recorded the lowest percentage

for all the experimental diets fed to the animals.

reduction of 24.74%. Table 2 shows the gross composition of the experimental diets and the calculated nutrient composition. The crude protein ranges from 17.99 % in T2 to 18.09 % in T4; while the metabolizable energy ranges from 2992 kcal/kg to 3003 kcal/kg.

Table 1: Anti-nutritional factors of raw and boiled *Senna occidentalis* seed meal

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: Gross composition and calculated nutrient values of the experimental diets

Ingredients (%)	DIETS				
	1	2	3	4	5
Maize	36.00	36.50	37.00	37.00	37.50
Soybean	27.00	25.00	24.00	24.00	20.00
Blood meal	2.45	2.45	2.45	2.5	2.0
BSOSM	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					
CP (%)	18.05	17.99	18.08	18.09	18.00
ME (kcal/kg)	2992	3000	3003	3003	3017
CF (%)	12.23	12.21	11.74	10.87	11.32
Calcium (%)	1.16	0.98	1.13	1.02	0.94
Ph (%)	0.62	0.62	0.61	0.58	0.53

*To provide the following per 100kg of the diet :440mg riboflavin, 720mg calcium,2g pantothenate, 2g niacin, 2.2g chloride, 15mg folic acid, 1mg vitamin B12, 15mg retinol,165mg vitamin D2, 1000mg DL-tocopherol acetate, 1700mg copper, 200mg iodide, 3000mg manganese, 5000mg zinc, 10,000mg iron.

*BSOSM: Boiled *Senna occidentalis* seed meal CP = Crude protein CF = Crude fibre
ME = Metabolizable energy Ph = Phosphorus

The growth performance parameters are shown in Table 3. Average feed intake recorded significant differences ($p<0.05$) between treatments for all the weeks with the values decreasing with increasing levels of *Senna* in the diet. The feed conversion ratio also followed similar trend with significant differences observed among all the treatments throughout the experiment except at weeks 4, 5 and 8. [8] and [9] reported similar 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 present in the feed

which significantly ($p<0.05$) reduced feed intake. The results of nutrients digestibility for all the treatments are shown in Table 4. Rabbits on the control diet had the highest digestibility values for crude protein, ether extract and nitrogen free extracts, which are necessary for growth and energy metabolism respectively. There were significant differences in all the nutrient digestibility parameters measured; with *Senna occidentalis* diets having significantly ($p<0.05$) higher digestibility of crude fibre than the control diet, and Treatment 4 and 5 having significantly ($p<0.05$) higher digestibility of ash than the other diets.

Table 3: Growth performance of weaner rabbits fed diets containing graded levels of pelleted boiled *Senna occidentalis* seed meal

Parameters	DIETS					SEM	LS
	1	2	3	4	5		
	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	*

^{abc}Means with different superscripts showed significant differences ($p<0.05$)

Av.d =Average daily, FCR=Feed conversion ratio, Init= Initial weight.

Table 4: Nutrient digestibility of rabbits fed diets containing graded levels of pelleted boiled *Senna occidentalis* seed meal (BSOM)

Parameter	DIETS					SEM	LOS
	1	2	3	4	5		
Dry matter	77.33 ^{ab}	73.85 ^b	79.80 ^a	77.84 ^{ab}	80.59 ^a	2.19	*
Crude Protein	82.74 ^a	78.13 ^b	78.67 ^{ab}	78.78 ^{ab}	76.88 ^b	1.99	*
Crude Fibre	69.09 ^b	73.22 ^{ab}	72.51 ^{ab}	78.66 ^a	76.13 ^{ab}	3.19	*
Ether extract	77.39 ^a	76.81 ^{ab}	73.98 ^{abc}	71.72 ^c	72.72 ^{bc}	2.06	*
Ash	63.68 ^c	74.42 ^b	75.48 ^b	82.13 ^a	84.22 ^a	2.74	*
NFE	89.38 ^a	84.14 ^b	85.93 ^{ab}	84.90 ^{ab}	83.49 ^b	2.13	*

^{abc}Means with different letters showed significant differences ($p < 0.05$)

1 = 0 % BSOSM, 2 = 2.5 % BSOSM, 3 = 5.0 % BSOSM 4 = 7.5 % BSOSM, 5 = 10.0 % BSOSM

*= Significant difference, LOS=Level of significance, SEM= Standard error of mean; NFE: Nitrogen Free Extract

The results of carcass traits are shown in Table 5. Rabbits on Diet 4 (7.5 % boiled *Senna occidentalis* seed meal) recorded significantly ($p < 0.05$) higher values for live weight, slaughter weight, and dressed weight. This result is contrary to the results obtained by [8] which revealed that performance variables and carcass weights decreased as the level of raw seeds increases in the diet from 2.5 % to 10 %. This could be attributed to the high amounts of anti-nutritional factors present in the raw seeds. [10] reported that anti-nutritional factors like tannin can affect the availability of amino acids and the utilization of protein thereby depressing growth. Final weight gain was highest in rabbits from Treatment 4 (fed 7.5 % inclusion level of boiled *Senna occidentalis* seed meal) from the fourth week of the experiment till the end of the experiment. This reveals that nutrients were not just digested but were also optimally absorbed and assimilated to aid body growth and weight gain. [11] reported that rabbits if fed balanced ration are efficient converters of feed to meat, however, [8] reported that performance of rabbits fed raw *Senna* seeds decreased linearly with increasing levels of *Senna* in the diet. This contradiction could be as a

result of high amount of anti-nutritional factors in raw *Senna*. However, at 10 % inclusion of boiled *Senna occidentalis* seed meal in the diet, rabbits recorded the lowest weight gain from the inception of the experiment till the end, even though they had recorded the highest digestibility value for dry matter. This could be as a result of possible effect of residual anti-nutritional factors present in the diet. [12] had stated that although the digestion of a diet may be good but the utilization can be poor due to impaired absorption; which can be due to the presence of certain anti-nutritional factors like phytohaemagglutinins, which exert a non-selective adverse effect on the absorption of nutrients from the intestinal tract rather than a direct effect on the digestive process. However, poor digestion in this case may also be attributed to higher levels of saponin content. Tannins reduce feed intake by decreasing palatability of diets because of its astringent effect on oral cavity. It also forms complexes with certain enzymes of the digestive tract seriously affecting utilization of carbohydrates and proteins and resulting in decreased growth, feeding efficiency, reduced metabolizable energy and reduced availability of amino acids [13].

Table 5: Carcass characteristics of rabbits fed pelleted boiled *Senna occidentalis* seed meal

Parameter	T1	T2	T3	T4	T5	SEM	LOS
LV weight(g)	1200.00 ^b	1216.70 ^b	1450.00 ^a	1600.00 ^a	1100.00 ^b	102.20	*
SL weight (g)	1150.00 ^{bc}	1116.70 ^c	1350.00 ^{ab}	1450.00 ^a	1050.00 ^c	102.20	*
EM weight(g)	1000.00 ^{ab}	850.00 ^b	1050.00 ^{ab}	1150.00 ^a	833.30 ^b	86.28	*
DR weight (g)	622.98 ^{dc}	651.99 ^c	758.03 ^b	912.84 ^a	538.61 ^d	40.28	*

^{abc}Means with different letters showed significant differences ($p < 0.05$).

SL weight=slaughter weight, *= Significant difference, LV weight = Live weight, EM weight = Empty weight, DR weight = Dressed weight.

CONCLUSION

Based on the results of this study, it can be concluded that pelleted boiled *Senna occidentalis* seed meal had no adverse effect on the growth performance, nutrient digestibility and carcass traits of rabbits. However, pelleted boiled *Senna occidentalis* seed meal optimized rabbit growth performance and carcass traits at 7.5 % dietary inclusion level.

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