

REPLACEMENT VALUE OF BOILED AND FERMENTED SORREL (*HIBISCU SABDARIFFA*) SEED MEAL FOR SOYA BEAN MEAL ON THE CARCASS CHARACTERISTICS OF GROWING RABBITS

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ABSTRACT

A ten-week feeding trial was conducted to determine the effect of replacing full-fat soya bean meal (FFSBM) with boiled and fermented sorrel seed meal (BFSSM) on the carcass characteristics of growing rabbits. Thirty cross-bred rabbits (New Zealand White X Dutch) between six and seven weeks of age with average initial body weight of 489.80 g were caged individually and allotted to five (5) dietary treatments. Each treatment was divided into three replicates of two rabbits. The rabbits were given diets and clean drinking water *ad libitum* throughout the period of the experiment. In diets 1 (control), 2, 3, 4 and 5 BFSSM replaced FFSBM at 0, 25, 50, 75, and 100%, respectively. The carcass characteristics were carefully measured. The slaughter weight, dressed weight, and dressing percentage were better in the T1 (control) and T3 (50% BFSSM) than the other treatments. The rack, loin, skin, feet, heart, liver, kidney, and abdominal fat were not affected ($P > 0.05$) by inclusion of the test material in the diets while slaughter weight, dressed weight, dressing percentage, shoulder, thighs, head, tail, lungs, caecum, large intestine, small intestine and stomach were affected ($P < 0.05$) by the inclusion of test material in the diets. The weight of shoulder and thighs in T1, T3 and T5 were heavier than T2 and T4. However, there were no significant ($P > 0.05$) differences among treatment groups in racks and loins. It was therefore concluded that, 50% of the full-fat soya bean in rabbit diets could be replaced with boiled and fermented sorrel seed meal without deleterious effect on carcass characteristics.

Keywords: Boiled and fermented sorrel seed meal, growing rabbits, and carcass characteristics

INTRODUCTION

In recent years, the use of soya bean and groundnut cake (GNC) which used to be the major plant protein of choice in monogastric diet is becoming limited due to the high cost of production and the competitive requirement of soya bean and groundnut cake in human diets. An alternative protein concentrate worth exploring is sorrel seed meal. The sorrel seed has good nutritional profile, it contains 38.57% protein, 20.50% ether extract, 16.50% crude fibre and 11.63% nitrogen-free extract (Kwari, 2009). Igwebuike *et al.* (2005) and Kwari (2009) successfully used the raw sorrel seed meal in the diets of growing rabbits and broiler chickens. However, Kwari (2009) recommended processing of the seed as a way of reducing tannins, an anti-nutritional factor present in the seed. This paper reports the effect of graded levels of boiled and fermented sorrel seed meal as a replacement for soya bean meal on the carcass measurements of growing rabbits.

MATERIALS AND METHODS

Location of the study

The study was conducted at the Livestock Teaching and Research Farm, University of Maiduguri, Maiduguri. (Sudan savanna region of Nigeria) along Bama Road Borno State and at an altitude of 354 m above sea level (Encarta, 2007). The area has a semiarid tropical climate with a wide seasonal diurnal range of temperature. The hottest months are April and May with a range between 39.4 and 40.1°C under shade. There is a long dry season of 7-8 months between the months of October and May. During the last 2-3 months of the dry season there is hot diurnal temperature and comparatively cooler nights. This is followed by a wet season between the months of June and September. The average annual rainfall is about 500 mm. The relative humidity is about 45% in August and usually lowers to about 5% in December and January.

Source and Processing of Sorrel Seeds

Sorrel seed were bought from Gamboru market in Maiduguri, Nigeria. The sorrel seed were thoroughly cleaned and subjected to boiling for 30 minutes and washed. The boiled seed were kept in

an air-tight container to ferment for three days. The fermented sorrel seeds were allowed to sun dry for three days, milled and labeled as boiled and fermented sorrel seed meal (BFSSM).

Experimental Stock and their Management

Thirty (30) rabbits between 6 and 7 weeks of age, were used for the feeding trial which lasted for ten (10) weeks. The rabbits were weighed and then randomly assigned to five dietary treatments; i.e six (6) rabbits per treatment. Each treatment was divided into three replicates of two rabbits per replicate in a Randomized Complete Block Design (RCBD). The rabbits were kept in separate cages with dimension of 42 cm x 42 cm x 42 cm (L x W x H). The cages were raised 1m above the ground for easy cleaning. Metallic feeding troughs and plastic drinkers were provided in each cage. Feeds and water were provided *ad libitum* throughout the period of the experiment.

Experimental Diets

Five (5) experimental diets were prepared for the growing rabbits. Full-fat soya bean meal was replaced with boiled and fermented sorrel seed meal (BFSSM) at 0, 25, 50, 75 and 100% levels in diets 1(control), 2, 3, 4 and 5, respectively. The ingredient composition and the calculated analyses of the experimental diets are presented in Table 1.

Table 1: Ingredients Composition (%) of the Experimental Diets

Ingredients	Levels of FFSBM Replace with BFSSM (%)				
	T1 (0)	T2 (25)	T3 (50)	T4 (75)	T5 (100)
Maize	40.35	40.35	40.35	40.35	40.35
Wheat Offal	12.00	12.00	12.00	12.00	12.00
Groundnut Cake	5.00	5.00	5.00	5.00	5.00
FFSBM	20.00	15.00	10.00	5.00	0.00
BFSSM	0.00	5.00	10.00	15.00	20.00
Groundnut Haulms	17.00	17.00	17.00	17.00	17.00
Fish Meal	3.00	3.00	3.00	3.00	3.00
Bone Meal	2.00	2.00	2.00	2.00	2.00
Salt (NaCl)	0.50	0.05	0.50	0.50	0.50
Premix*	0.15	0.15	0.15	0.15	0.15
Total	100	100	100	100	100

premix: Vitamin A, 5000,00 IU; Vitamin D₃ 800,000 IU; Vitamin E, 12,000 mg; Vitamin K, 1,5000 mg; Vitamin B₁, 1,000 mg; Vitamin B₂, 2,000 mg, Vitamin B₆, 1,500 mg; Niacin, 12,000 mg; pantothenic acid, 20.00 mg; Biotin,10.00 mg; Vitamin B₁₂, 300.00 mg; folic acid, 150,000 mg; choline, 60,000 mg; manganese, 10,000 mg; iron;15,000 mg, zinc 800.00 mg; copper 400.00 mg; iodine 80.00 mg; cobalt 40 mg; selenium 8,00 mg.

FFSBM = Full-fat Soya bean Meal

BFSSM=Boiled and Fermented Sorrel Seed meal

NFE = Nitrogen-free extract

ME = Metabolizable energy: Calculated according to the formula of Pauzenga (1985) as:

ME (Kcal/kg) = 37 x % CP + 81 x % EE + 35.5 x % NFE

Carcass Characteristics

At the end of the experiment, three rabbits (one rabbit from each replicate based on average weight) from each treatment, were selected for slaughter. They were deprived of feed for 12 hours. but drinking water was provided. Withholding feed for 12 hours before slaughter reduced the volume of gut contents and hence bacteria, and therefore reduced the risk of contamination of the carcass during dressing without adversely affecting meat yield and quality. The rabbits were weighed in the morning and slaughtered by cutting transversely across the trachea, oesophagus, large carotid arteries and jugular veins to ensure maximum bleeding. They were later opened and dressed. The dressed carcass is the portion of the rabbit remaining after the removal of the head, feet, skin (pelt), tail and visceral organs including kidneys. The dressed carcasses were split into retail cuts such as shoulder/forelegs, thigh/hindleg, rack and loin as described by Blasco *et al.* (1993). The dressed carcass and the retail cuts were weighed and expressed as percentage of slaughter weight.

Dressing percentage = $\frac{\text{Carcass weight (g)}}{\text{Slaughter weight (g)}} \times 100$

Statistical Analysis

All data collected in the course of the experiment were subjected to analysis of variance (ANOVA) using the Randomized Complete Block Design (Steel and Torrie, 1980) and where applicable, Duncan's multiple range test (Duncan, 1955) was used for mean separation. Computer package (Statistix 9.0) was used for the analysis.

RESULTS AND DISCUSSION

Carcass characteristics

The carcass parameters are summarized in Table 4. There were significant difference ($P < 0.05$) among treatment groups for slaughter weight, dressed weight and dressing percentage. T1 (control), T2 (25% BFSSM) and T3 (50% BFSSM) had heavier slaughter weight compared to T4 (75% BFSSM) and T5 (100% BFSSM). The dressed weight for T3 was closer to that of control which was higher than others (T2, T4 and T5). The dressing percentage for T3 was also close to the control while the lowest value was recorded by T2 (25% BFSSM) in the diet. The dressing percentage obtained here (52.99 to 60.55 %) compared favourably with the range (50 to 56%) reported by Fielding (1991) for rabbits of similar age and weight. Similarly, the values obtained in this study are close to the values (48.21 to 56.00%) obtained by Igwebuike (2001) who fed *Acacia albida* pod to growing rabbits. The values for retail cuts expressed as percentage of slaughter weights indicated that there were no significant ($P > 0.05$) difference among treatment groups with respect to the rack and loin while there were significant ($P < 0.05$) difference among the treatment groups for shoulder/forelegs and thighs/hindlegs. The value (16.91%) of shoulder/forelegs obtained in control (0% BFSSM) group compared favorably with values (17.60 and 17.37%) obtained in the T3 (50% BFSSM) and T5 (100% BFSSM), respectively which were higher than other treatment values. The thighs of T1, T3 and T4 were significantly ($P < 0.05$) higher than T2, but similar ($P > 0.05$) to those fed T3 diet.

The weight of organs/body components expressed as percentage of slaughter weight indicated that skin, feet, heart, liver, kidneys and abdominal fats were not significantly ($P > 0.05$) different among the treatments while head, lungs, caecum, large intestine, small intestine and stomach were significantly ($P < 0.05$) different among the treatments. The control group (0% BFSSM) has the lowest weight of head, tail and large intestine compared to other treatment groups. However, weight of various organs and body components expressed as percentage of slaughter weight were comparable to the values reported for healthy rabbits of similar ages and weight (Abu and Ekpenyong, 1993; Igwebuike, 2001).

Table 2: Carcass Characteristics of Rabbits Fed Different Levels of Boiled and Fermented Sorrel Seed Meal (BFSSM) as a replacement for FFSBM

Parameters	T ₁ (0)	T ₂ (25)	T ₃ (50)	T ₄ (75)	T ₅ (100)	SEM
Slaughter weight (g)	1371.30 ^a	1195.30 ^{ab}	1279.70 ^{ab}	1137.70 ^b	111.30 ^b	68.93*
Dressed Weight(g)	830.33 ^a	633.33 ^b	732.33 ^{ab}	624.33 ^b	623.67 ^b	49.90*
Dressing Percentage(g)	60.55 ^a	52.99 ^c	57.26 ^{ab}	54.88 ^{bc}	56.12 ^{bc}	1.23*
Retail Cut as Percentage of Slaughter Weight						
Shoulder/Forelegs	16.91 ^a	15.34 ^b	17.60 ^a	14.75 ^b	17.37 ^a	0.33*
Rack	5.50	5.37	4.81	5.09	5.34	0.61 ^{NS}
Loin	11.16	10.42	10.83	10.63	10.17	0.78 ^{NS}
Thighs/Hindlegs	24.12 ^a	21.19 ^b	22.47 ^{ab}	23.76 ^a	23.37 ^a	0.73*
Weight of Organs/Body Components Expressed as Percentage of Slaughter Weight						
Head	8.90 ^b	10.85 ^a	9.52 ^{ab}	10.29 ^{ab}	10.05 ^{ab}	0.46*
Tail	0.31 ^b	0.36 ^{ab}	0.55 ^{ab}	0.66 ^a	0.37 ^{ab}	0.09*
Skin	8.76	8.97	8.58	8.39	7.88	0.65 ^{NS}
Feet	2.27	3.05	2.45	2.47	2.52	0.33 ^{NS}
Heart	0.42	0.39	0.29	0.26	0.28	0.11 ^{NS}
Liver	2.49	2.77	2.66	2.88	2.37	0.25 ^{NS}
Kidney	0.75	0.68	0.60	0.60	0.66	0.09 ^{NS}
Lungs	0.63 ^{ab}	0.90 ^a	0.53 ^a	0.52 ^b	0.66 ^{ab}	0.11*
Caecum	4.43 ^{ab}	6.25 ^a	5.89 ^{ab}	6.05 ^a	3.56 ^b	0.77
Large intestine	1.19 ^b	1.75 ^{ab}	2.15 ^{ab}	2.80 ^a	1.78 ^{ab}	0.49*
Small intestine	3.62 ^{ab}	4.09 ^a	2.90 ^{ab}	2.70 ^b	3.58 ^{ab}	0.39*
Stomach	3.58 ^{ab}	3.86 ^a	3.10 ^{ab}	2.84 ^{ab}	2.00 ^b	0.52*
Abdominal fat	2.35	1.75	1.88	1.14	1.92	0.34 ^{NS}

SEM = Standard Error of Means; NS = Not Significant (P > 0.05) Different

* = Significant (P < 0.05) Different

a, b, c = Means in the same row bearing different superscripts differ significantly (P < 0.05) FFSBM = Full-fat Soya Bean Meal

BFSSM = Boiled and Fermented Sorrel Seed Meal

CONCLUSION

Based on this finding, boiled and fermented sorrel seed meal (BFSSM) had no deleterious effect on the carcass characteristics of growing rabbits. Therefore, up to 100% of BFSSM can replace full fat soya bean in rabbits' diet.

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