



RESPONSE OF GROWER RABBITS FED DIET CONTAINING BOILED SORREL (*HIBISCUS SABDARIFFA L.*) SEED MEAL ON PERFORMANCE GROWTH

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Abstract

The experiment was conducted to evaluate the performance of grower rabbits fed sorrel seed (*Hibiscus sabdariffa L.*) meal. Thirty grower rabbits were randomly allotted to five (5) dietary treatments containing the control diet, raw seed diet and boiled sorrel seeds in already boiled water for 15, 30 and 45 minutes. Completely randomized design (CRD) was used with six (6) rabbits per treatment and two (2) rabbits per replicate. The result of the experiment showed that there was significant difference ($P < 0.05$) in average daily feed intake but no significant ($P > 0.05$) differences in final body weight gain, daily weight gain, total feed intake, feed conversion ratio and feed cost/kg gain of rabbits fed diet containing sorrel seeds boiled at varying boiling duration. Feed conversion ratio was better in rabbits fed the 30 minutes boiled sorrel seed based diet (6.28) compared to rabbits fed 45 minutes boiled sorrel seed based diet (7.69). The final weight increased as boiling duration increased but later declined as boiling duration increased to 45 minutes (1360.00, 1286.67, 1293.33, 1386.67 and 1306.00g/rabbit) respectively. Feed cost/kg gain value was lower in rabbits fed diet containing boiled sorrel seeds at 30 minutes (₦600.20) compared to other treatments. Based on the result of the study, it was therefore concluded that grower rabbits could tolerate up to 15% sorrel seed meal boiled for 30 minutes in their diets. Further studies should be checked for boiling periods above 30 minutes.

Key words: Rabbits, sorrel seed meal, boiling and performance growth

Introduction

The huge animal protein deficit in the diet of Nigerians can be addressed by placing emphasis on the production of highly prolific and short cycle animal species such as rabbits (Oyawoye, 2002; Hasanat *et al.*, 2006). Rabbits however, require a good balance dietary protein for their maximum performance. Conventional feed are short in supply, expensive and highly consumed by human in Nigeria. This constitutes a major setback to increased rabbit production in the country and calls for research into less conventional sources of protein for rabbit feeding. The use of unconventional feed ingredients in compounding livestock feed in order to reduce cost of production is documented in literature (Abeke, 2008 and Duru, 2010). Non-conventional feedstuffs offer the best alternatives in our environment for reducing feed cost and therefore a reduction in the cost of meat productions (Dafwang *et al.*, 2001). There is need to find alternative feed ingredients that can substitute for the more conventional feedstuffs which are expensive and highly needed for human and industrial needs. Sorrel (*Hibiscus sabdariffa*) seed is an alternative feed resources that has been found to thrive on a wide range of tropical soil conditions, and can perform well on relatively poorer soil (Adanlawo and Ajibade, 2006). The seed contain high amount of protein, dietary fibre, and mineral such as phosphorus (P), calcium (Ca) and magnesium (Mg) (Ismail *et al.*, 2008). The seeds contain about 35.90% crude protein (CP), 10.14% ether extract (EE), 10.09% ash and 15-17% crude fibre (CF) (Dashak and Nwanegbo, 2002). Kwari *et al.* (2011) also reported raw sorrel seeds to contain 5.18% arginine, 16.5% CF, 13.5% EE and 38.57% CP while Abdu *et al.* (2008) reported 23.46% CP value. However, Nyameh *et al.* (2012) reported that boiled sorrel seeds contain 22.84% CP, 8.50% CF, 6.50% EE, 6.50% ash, 45.66% NFE and 91.70% DM. while Maikano *et al.* (2014) reported a value of 21.84% CP, 3.60% CF, 5.85% EE, 5.39% ash, 90.40% DM, 53.72% NFE, 1.12% Ca and 0.56% P, respectively.



MATERIALS AND METHODS

Experimental Site

The experiment was carried out at the Rabbitary Unit of the Department of Animal Science Teaching and Research Farm, Ahmadu Bello University, Zaria. Zaria is within the Northern Guinea Savanna zone of Nigeria, with Latitude 11° 09' 01.78" N and Longitude 7° 39' 14.79" E at an altitude of 671m above sea level (Ovimaps, 2015).

Sources of Rabbits and Sorrel Seeds

The rabbits of mixed breeds and sexes aged 7 – 8 weeks were sourced from rabbit farms within Zaria metropolis, the sorrel seeds and other ingredients were purchased from an open market in Sabon Gari, Zaria.

Processing of Sorrel Seeds

The raw sorrel seeds were sorted to ensure cleared grains. The method adopted by Ari *et al.* (2012) was used for processing. The cleaned sorrel seeds were poured into 20litres of already boiled water per batch of 10kg at 100°C i.e. in ratio of 2:1 at different boiling duration of 0, 15, 30 and 45 minutes, respectively. The products were then sun dried by spreading on trays until well dried (at least 75-80%DM), after which it was milled, bagged and stored for experimental diet formulation purpose.

Experimental Diet

Five experimental diets were formulated to meet the requirements of rabbits according to NRC (1994). These include T1 (Sorrel seed free diet as control); T2 (Raw sorrel seeds diet); T3 (Diet containing Sorrel seeds boiled at 15 minutes); T4 (Diet containing Sorrel seeds boiled at 30 minutes) and T5 (Diet containing Sorrel seeds boiled at 45 minutes)

Table 1: Composition of experimental diets

Ingredients (kg)	Duration of boiling of sorrel seeds (minutes)				
	Control	Raw (0)	15	30	45
Maize	45.05	36.98	38.09	38.12	38.33
Soya bean cake	12.45	5.52	4.41	4.38	4.17
Boiled sorrel seed meal	0.00	15.00	15.00	15.00	15.00
Groundnut Haulms	40.00	40.00	40.00	40.00	40.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated Analysis					
Crude protein (%)	18.41	18.99	18.60	18.59	18.52
Crude fibre (%)	6.82	8.62	8.55	8.55	8.54
Ether Extract (%)	5.39	5.76	5.73	5.73	5.72
Metabolizable energy (Kcal/kg)	2852	2767	2779	2779	2781
Calcium (%)	0.67	0.68	0.68	0.68	0.68
Available Phosphorus (%)	0.42	0.47	0.47	0.47	0.47
Lysine (%)	0.83	0.81	0.78	0.78	0.78
Methionine + cysteine (%)	0.72	0.67	0.66	0.66	0.65
Ca:P	1.6	1.4	1.4	1.4	1.4
Cost/kg diet (₦)	100.21	95.41	95.55	95.56	95.58

**Bio-premix supplied per kg of diet: Vit A, 12500 I.U; Vit D₃, 2500 I.U; Vit E, 50mg; Vit K₃, 2.5mg; Vit B₃, 3.5mg; Vit B₆, 6mg; Niacin, 40mg; Pantothenic acid, 10mg; Biotin, 0.8mg; Vit B₁₂, 0.25mg; Folic acid, 1mg; Choline chloride, 300mg; Manganese, 100mg; Iron, 50mg; Zinc, 45mg; Iodine, 1.55mg; Selenium, 0.1mg; Copper, 2mg; Cobalt, 20mg.



Experimental Design and Management of Animals

Thirty (30) weaner rabbits of mixed breeds and sexes aged 7-8 weeks were randomly allotted into five (5) treatments with three (3) replicates per treatment; each replicate had two (2) rabbits in a Completely Randomized Design (CRD). Before the commencement of the experiment, they were dewormed using ivermectin® dewormer. The rabbits were housed in galvanized wire cages of 40 x 60 x 60cm dimension. Each cage was equipped with a small rubber bowl drinker and a clay/earthen pot feeder. Feed and clean water were supplied *ad-libitum* for a period of 56 days after an adjustment period of a week.

Data Collection

Feed offered and left over were weighed to determine feed intake of the animals. After the initial weight, weekly weights were taken. These records were used to monitor and determine the performance parameters in terms of average feed intake (AFI), average weight gain (AWG), feed conversion ratio (FCR), final body weight and feed cost/kg gain. Mortality was also recorded as they occur.

RESULTS

Performance of Grower Rabbits Fed Boiled Sorrel Seed Meal

There were no significant differences ($P>0.05$) in all performance parameters measured except for total and average daily feed intake which were reduced significantly ($P<0.05$) as the duration of boiling increases. Rabbits fed control, raw and 15 minutes based diets were statistically the same as compared to rabbits on 30 and 45 minutes based diets in terms of daily feed intake. It was observed that rabbits fed the 30 minutes boiled sorrel seed based diet had the lowest average daily feed intake, highest weight gain, the least FCR and feed cost /kg weight gain.

Table 2: Effect of different duration of boiled sorrel seed meal on performance of grower rabbits

Parameters	Duration of boiled sorrel seed (minutes)					SEM	LOS
	Control	Raw (0)	15	30	45		
Initial body weight (g/rabbit)	853.33	800.00	813.33	876.67	855.00	48.83	NS
Final body weight (g/rabbit)	1360.00	1286.67	1293.33	1386.67	1306.00	85.91	NS
Average daily weight gain (g/rabbit)	9.05	8.69	8.57	9.11	8.07	0.90	NS
Total feed intake	3476.48 ^a	3517.36 ^a	3587.36 ^a	3178.56 ^b	3265.92 ^b	129.92	*
Average daily feed intake (g/rabbit)	62.08 ^a	62.81 ^a	64.06 ^a	56.76 ^b	58.32 ^b	2.32	*
Feed conversion ratio	6.87	7.28	7.61	6.28	7.69	0.73	NS
Feed cost per kg (₦)	100.21	95.41	95.55	95.56	95.58	—	NA
Feed cost/kg gain	688.17	694.84	727.28	600.20	735.82	69.61	NS
Mortality (%)	0.00	0.00	0.00	0.00	0.33	0.15	NS

abc: means with different superscript on the same row differ significantly at $p<0.05$

SEM: standard error of mean

LOS : level of significance

NS : Not significant

NS : Not analysed



DISCUSSIONS

Performance of Grower Rabbits Fed Boiled Sorrel Seed Meal

The various diets fed to the rabbits showed no significant differences. Rabbits that performed best were those fed 30 minutes duration of BSSM because it showed the highest weight gain, the best feed conversion ratio (FCR) despite having the lowest feed intake. This can be an indication that the rabbits were able to utilize and convert feed to gain. The above result was in line with the result reported by (Kaga 2013) when *Delonix regina* seeds cooked at different duration were fed to rabbits. Mortality of 0.33% was only recorded for 45 minutes boiled sorrel seed based diet.

The FCR of rabbits fed 30 minutes boiled sorrel seed based diet was the best although there were no significant difference ($p>0.05$) when compared with control, raw (0), 15 and 45 minutes boiling duration. This agreed with the reports of (Musa and Ogbadoyi, 2012) who stated that boiling reduces the level of anti-nutrients and toxic substances with retention of most micro-nutrients in amount sufficient to meet animal's dietary requirement but boiling beyond 30 minutes reduces B-carotene levels in seeds. Despite the anti-nutrients present in the raw seed based diet, they performed better than 45 minutes based diet. This result agreed with the findings of Halimatul *et al.* (2007) who reported that the quality of two differently processed (dried and boiled) roselle seed powder are similar and affect performance significantly when the seeds were boiled at 100°C for 30 minutes. Therefore, the anti-nutrient of raw roselle seed might not affect feed digestibility and biological value.

CONCLUSION AND RECOMMENDATIONS

Based on this experiment, the highest value for final weight and best value for FCR were obtained from rabbits fed 30 minutes duration of boiled sorrel seed meal (BSSM) despite showing no significant difference. It was observed that rabbits could tolerate raw sorrel and boiled sorrel seed meals up to 30 minutes duration in their diet without negatively affecting performance parameters. Higher duration of boiling beyond 45 minutes resulted in a decline in performance of the rabbits. This was attributed to the fact that prolonged boiling reduces B-carotene levels in seeds or leaching and denaturation of protein in the samples. Boiling of sorrel seeds for 30 minutes was recommended as the optimum duration if boiling method is adopted.

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