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EFFECT OF DIFFERENTLY PROCESSED BAMBARA GROUNDNUT (*Vigna subterrenea*) SEED MEAL ON GROWTH PERFORMANC E OF GROWER RABBITS

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ABSTRACT

The study investigated the performance of grower rabbits on differently processed Bambara Groundnut (*Vigna subterrenea*) Seed Meal (BGSM) to identify the most suitable processed form of Bambara groundnut seed meal for rabbits ration. Bambara groundnut seed were divided into lots and processed differently as soaked, cooked and toasted meals while the unprocessed lot was used as control diet. The differently processed bambara groundnut seed meals were included at the rate of 25% into four treatments and designated as T_1 (control), T_2 (soaked), T_3 (cooked), and T_4 (toasted) respectively. Twenty (20) grower rabbits of mixed sexes were weighed and randomly assigned to the four treatment diets with five rabbits per treatment in a Completely Randomized Design (CRD). The performance parameters measured were; initial weight, final weight, total weight gain, feed intake, feed conversion ratio and mortality. performance parameters were measured and results in the study showed that rabbits showed no ($P>0.05$) significant differences in the initial weight, final weight, total weight gain when fed differently processed bambara groundnut seed meal, except on feed intake. However, rabbits on diet T_2 (soaked) recorded the best performance in terms of feed conversion ratio (3.06) and weight gain (454.80g) among the processing methods which supported the health status for the animals. Conclusively, including soaked bambara groundnut seed meal at 25% can support growth and maintain a health status for the rabbits.

Keywords: Performance, grower rabbits, processed Bambara groundnut

INTRODUCTION

Animal protein is very essential for the growth, development and maintenance of human life particularly because it contains all the essential amino acids needed for this purpose. Shortage of protein, particularly those of animal origin is prevalent in most parts of Africa where it is estimated that on the average, 10g of animal protein is consumed per day as against the recommended daily intake of 35g (FAO, 2001). Atsu (2002) also reported that the average consumption of animal protein in Nigeria is estimated at 4.5g/head/day. In order to ensure adequate supply of protein to the rapidly growing population of Nigeria, the output of animal products has to be increased especially through the production of short cycle animals such as rabbits, poultry and pigs (Ozor and Madukwe, 2001). Hence, the rabbit's high prolificacy, fast growth rate, high energetic selection potential, high feed conversion efficiency as well as economic utilization of space among other advantages (Hassan *et al.*, 2012) make them a viable option.

Feed accounts for the dominant input in animal production ranging from 60-80% of the total cost of production (Nworgu *et al.*, 1999; Esonu, 2006). Similarly, feed ingredients have been reported to account for over 90% of compound feed industry. Therefore, the relationship between feed ingredient and animal product output is both direct and obvious. It has been observed that feedstuffs are very expensive and scarce, the high cost and scarcity derived from

crippling realities that are characteristics of the economics of developing countries (Esonu *et al.,* 2001; 2002; 2004). Conventional ingredients are expensive since they suffer from with channels in the food chain which command higher priority and can pay higher prices that the compound feed industry.

Bambara groundnut has long been used as an animal feed. Several workers have successfully fed processed bambara groundnut to livestock animals such as poultry (Oluyemi *et al.,* 1976; Onwudike and Eguakun, 1994; Arijenwa and Omoikhoje, 2004) and rabbits (Joseph *et al.,* 2000; Akande, 2009). The haulms were found to be palatable (Doku and Karikari, 1971), and the leaves were reported to be rich in Nitrogen and Phosphorus, and therefore suitable for livestock grazing (Rassel, 1960; Akande *et al.,* 2009).

However, the use of bambara nut in the feed of monogastric animals is limited by the presence of anti-nutrients such as protease inhibitors, haemaglutinins, tannins, cyanogenic glycosides and flatulence factors in the raw bean (Ensminger, 1996). These are substances in diets that interfere with the normal digestion, absorption and utilization of the diet. A number of these substances occur naturally especially in plant materials, mostly in legumes. Low levels of trypsin inhibitor and phenoplic compounds have been identified in bambara groundnut seed (Poulter, 1981; Brough *et al.,* 1993).

Boiling, toasting and soaking have been identified as one of the processing methods which has been used (Amaefule, 2000) to inactivate anti-nutrients (ANF). Akinmutimi (2004) observed that most processing methods employed in improving the feed value of unconventional or alternative feedstuffs do not completely eliminate anti-nutrients, but only reduce their concentrations to tolerate levels in feedstuffs. Quantities of anti-nutrients present in formulated rations therefore will depend on the concentration of these substances in feed stuffs which invariably is determined by processing methods. (Alozie, *et al.,* 2009) Processing methods therefore influence quality of compounded rations or diets. This experiment was conducted to investigate the effects of differently processed bambara groundnut seeds diet on the performance and feed conversion efficiency of grower rabbits.

MATERIALS AND METHODS

Experimental site

This study was carried out at the Rabbitary Unit of Teaching and Research Farm of the Department of Animal Science, Taraba State University, Jalingo. Jalingo is located between north $8.53^0$and 11.22^0 east on latitude 11,3667 of the equator and possesses a tropical climate. This area is characterized by high temperature throughout the year, because of high radiation income which is relatively evenly distributed throughout the year. Maximum temperature of about 40^0C has been observed in the area with minimum temperature as low as 18^0C between December and January. Mean annual temperature ranges between 26.9 and 27.8^0C (Taraba State Diary, 2008).

Experimental animals and management

Twenty grower rabbits of mixed sexes were bought, from a reputable farm around the study area. They were weighed and randonmly assigned to the four treatment diets with five rabbits per treatment. The rabbits were housed in a standard hutch of 0.6m x 0.6m x 0.6m and raised 0.3m from the ground in a single-tier hutch system. They were equally provided with feeders and drinkers. The floor was swept daily; clean drinking water and a determined quantity of fresh feed were provided daily. The remnant feed were collected and weighed daily to determine the daily feed intake. Before the

Commencement of the experiment, the rabbits were administered antibiotics according to body weight and were dewormed using albendazole tablet.

Processing of bambara seeds

Bambara groundnut seeds (*Vigna subterrenea)* were purchased from Jalingo main market. The bambara seeds were divided into four lots and subsequently processed as follows:

Unprocessed

This lot of raw bambara groundnut seeds were subjected to milling without any form of processing and was referred to as raw bambara nut seed meal (RBSM).

Boiling

This lot was subjected to boiling at 100^0C for 60 min. The boiled seeds were sun dried for three days to rduce moisture content before being milled and was tagged boiled bambara nut seed meal (BBSM)

Toasting

Raw bambara nut seeds were subjected to toasting for 20 minutes at high temperature (110^0C). The resultant product was cooled, milled and was called toasted bambara seed meal (TBSM).

Soaking

The raw bambara nut seeds were soaked in a container containing clean water for 24 hours. After 24 hours, the water was decanted and the soaked seeds were sundried for three days to reduce the moisture content. The seeds were milled and referred to as soaked bambara nut seed meal (SBSM).

Experimental design

The four diets, T_1 (control), T_2 (soaked), T_3 (cooked), T_4 (toasted) were formulated using maize, soyabean meal, GNC, rice bran, bambara seed meal, bone meal, vitamin premix, and common salts to contain 25% RSBM, BBSM, TSBM, and SBSM bambara nut seed meals, respectively.

Table 1 Composition of experimental diets

Ingredients	**T_1 (RBSM)**	**T_2 (SBSM)**	**T_3 (CBSM)**	**T_4 (TBSM)**
Maize	50.50	50.50	50.50	50.50
Soyabean meal	10.00	10.00	10.00	10.00
Groundnut cake	10.00	10.00	10.00	10.00
Rice bran	3.00	3.00	3.00	3.00
Bambara nut meal	25.00	25.00	25.00	25.00
Bone meal	1.00	1.00	1.00	1.00
Salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
TOTAL	**100.00**	**100.00**	**100.00**	**100.00**
Calculated competition				
ME (Kcal/kg)	2700	2700	2700	2700
Crude Protein	18.02	18.02	18.02	18.02
Determined composition				
Dry matter (%)	91.60	91.17	91.22	91.25
Crude Protein (%)	20.06	18.71	17.86	16.34
Crude Fibre (%)	3.96	3.86	3.72	3.46
Ether Extract (%)	3.96	3.86	3.76	3.28
Ash (%)	4.01	3.89	3.77	3.50
NFE (%)	59.61	60.87	62.13	64.68

*Animal care premix provided per Kg of diet:: Vitamin A, 12,000iu;D_3, 3,000,000iu; Vitamin E, 30,000mg; Vitamin K_3, 2,500mg; folic acid 1,000mg, niacin 40,000mg, calpan 10,000mg, vit B_2 20mg, vit B_1 2,000mg, vit B_6

3,500mg biotin 80mg, cobalt 250mg, selenium 250mg, antioxidant 125,000mg, iodine 1,200mg, iron 40,000mg, manganese 70,000mg, copper 8,000mg, zinc 60,000mg, and sodium chloride 200,000mg.

Experimental design

The four treatment groups were assigned to the four experimental diets in a Completely Randomized Design (CRD). Each treatment was replicated five times with one (1) rabbit per replicate. Each replicate received an assigned diet for eight (8) weeks.

Data collection

Performance parameters

The measured performance parameters were initial weight, final weight, average weight gain, feed intake and feed conversion ratio.

Proximate composition

Proximate analysis were carried out according to the method ofAOAC (1999) at the Department of Animal Sscience Laboratory, Taraba State University, Jalingo to determine the dry matter, crude protein, crude fibre, ether extract ash and nitrogen free extyract (NFE) contents of the experimental diets and processed bambara nut meals.

Statistical analysis

The experimental data were subjected to analysis of variance (ANOVA) procedure in a Completely Randomized Design using Statistical Package for Science (SPSS) version 16. Differences among treatments means were separated using Duncan Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Proximate composition of raw and processed bambara groundnut seed meals

The result of proximate composition of the differently processed bambara ground nut seed meal is presented in Table 1. The result showed that protein content of raw bambara groundnut seed meal (RBSM) used in the study was found to be 19.80% which was similar to that reported by Abdulsalami and Sheriff (2010) but higher than that reported by Okonwko and Opara (2010). The protein content of the processed meals decreased after cooking for 60 minutes (14.21%) but greatly increased (41.33%) after soaking and even after toasting (37.65%). Similar reduction in protein after cooking was observed by Hamed *et al*. (2008) and Hainida *et al.* (2008) for pumpkin and roselle seeds, respectively. An increament in protein content after soaking was also observed by Hassan *et al.* (2005) for Lupin seeds and he attributed the increment to quantitative reduction of the anti-nutritional factors (tannin and phytic acid) and other water soluble constituents. The decrease in protein content after cooking possibly due to solubilisation of protein by heating which lead to loss of protein in the final product as explained by Deman, (1999) or might be attributed to denaturation of protein during heating as reported by Bradbury *et al.* (1984). Fibre content of the bambara groundnut seed meals were 3.40%, 2.88%, 1.25% and 1.95% for raw, soaked, cooked and toasted meals respectively. These values disagree with the findings of Abdulsalami and Sheriff (2010), and Akande (2007). The reason for the decrease can be attributed to the processing methods.

The ether extracts content of the differently processed bambara seed meals obtained were found to be lower than that obtained by Akande et al (200&) and Abdulsalami and Sheriff (2010). The values recorded were 4.25, 3.86 and 3.53% for the toasted, soaked and cooked meals respectively. The ash content of the cooked (2.61) and toasted (2.84) meals were lower while the soaked was higher than the findings of Abdulsalmi and Sheriff (2010).

Table 2 Proximate composition of differently processed bambara groundnut seed meals

Proximate Composition (%)	RBSM	SBSM	CBSM	TBSM
Dry matter	93.30	90.90	89.55	90.18
Crude protein	19.80	41.33	14.21`	37.65
Crude fibre	3.40	2.88	1.25	1.95
Ether extract	4.60	3.86	3.53	4.25
Ash	3.80	3.81	2.61	2.84
NFE	59.16	39.03	67.96	43.51

RSBM = Raw bambara seed meal; SBSM = soaked bambara seed mmeal, CBSM = cooked bambara seed meal and TBSM = toasted bambara seed meal.

Performance of rabbits fed and processed seed meals

Results of the performance of the grower rabbits fed the differently processed bambara groundnut seed based diet is presented in Table 3. Results obtained from this experiment showed that there was no ($P<0.05$) significant differences in all the performance parameter evaluated except for feed intake. From the results in the Table, there was no ($P<0.05$) significant differences in initial weight of the grower rabbits. T_1 (1030.00g) had a higher 0.10g T_2 (1020.00g), T_3 (1020.00g) and T_4 (1020.00g). The results also showed that though there was no ($p<0.05$) significant difference in the final weight gain of the rabbits fed the diets containing the differently processed bambara groundnut seed meals. There were variations in the final weight of the grower rabbits. The differences in the final weight could be due to the differences in the feed intake and the level of anti-nutritional factors in the diets. Processing methods do not completely eliminate anti-nutritional factors, but reduces them to tolerate level (Akinmutimi, 2004).However, there was no significant differences ($P>0.05$) in the weight gain of the rabbits fed the four differently processed treatments diets. However, there were variations in the values obtained for weight gain among the different treatment groups. The values were 511.40g (T_1), 454.40g (T_2), 4432.60g (T_3) and 414.20g (T_4) respectively with rabbits on diet T_1 having the highest weight gain. The differences in weight gain may be attributed to the variations in protein fractions of the diet. This assertion conforms to the study of Ironkwe and Amaefule (2012).The feed intake recorded a significant difference ($P>0.05$). Rabbits on treatment 1 (control) had the highest feed intake (1561.80g) which corresponds to the highest weight gain among the treatment groups. There was no significant difference ($P<0.05$) in the feed conversion ratio among rabbits fed the differently processed bambara groundnut seed meals. The feed conversion ratios were 3.07, 3.06, 3.33 and 3.51 for T_1, T_2, T_3 and T_4 respectively. The FCR rabbits on T_1 was higher than the value 3.85 reported by Ironkwe and Amaefula (2012) for rabbits fed ram bambara offal. This implies that the animals were able to convert the feeds efficiently for their performance and activities. The experiment recorded zero (0.00) mortality which indicates that the levels of toxicity in the feed were within tolerable level for the grower rabbits.

Table 3: Effect of the experimental diets on performance of grower rabbits

Parameters	Diet 1 (RBSM)	Diet 2 (SBSM)	Diet 3 (CBSM)	Diet 4 (TBSM)	SEM
Average Initial Weight (g)	1030.00	1020.00	1020.00	1020.00	25.85
Average final weight (g)	1541.40	1474.80	1463.60	1434.20	15.29
Total weight gain (g)	511.40	454.80	443.60	414.20	27.33
Total feed intake (g)	1567.80[a]	1391.60[c]	1477.60[b]	1454.00[b]	8.02*
Feed conversion ratio (FCR)	3.07	3.06	3.33	3.51	0.19
Mortality	0.00	0.00	0.00	0.00	0.00

abc = means on the same raw not followed by the same letter are significantly different (P<0.05).
SEM = Standard error of mean. RSBM = Raw bambara seed meal, SBSM = Soaked bambara seed meal, CBSM = Cooked bambarta seed meal, TBSM = Toasted bambara seed meal.

CONCLUSION

The conclusion shows that, at 25% level of inclusion, there were no differences in performance between rabbits fed raw and processed (boiled, toasted, soaked) bambara groundnut seed based diets. Raw or processed bambara groundnut did not support remarkable changes in the performance for grower rabbits at 25% dietary level of inclusion. No mortality was recorded and there is an indication that the inclusion of up to 25% of raw and processed bambara groundnut seed meal is healthy for grower rabbits.

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