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Nutritional Value of Differently Processed Breadfruit (*Artocarpus altilis* Forsberg) Meal for Grower Rabbits

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ABSTRACT

An eight week study was conducted to determine the nutritive value of Raw Breadfruit Meal (RBFM), Cooked Breadfruit Meal (CBFM) and Fermented Breadfruit Meal (FBFM) for the grower rabbit to increase their feed resources base and reduce cost of feeding. Breadfruit meals were included at 25% in the three diets except the control and the diets fed to four groups of fifteen rabbits in a completely randomized design. Data was collected on feed intake, weight gain, feed conversion ratio, digestibility, carcass and haematological characteristics. Results showed that weight gain of the rabbits that were fed control diet (15.4 g) was lower ($p<0.05$) than those fed FBFM (16.4 g) but higher than that of the group fed RBFM (12.8 g). Final weight, total weight gain, live weight, carcass weight and carcass yield followed similar trend. Feed consumed by the rabbits that were fed RBFM was lower ($p<0.05$) than that of the control, CBFM and FBFM diets. Rabbits that received RBFM also had lower ($p<0.05$) digestibility, Packed cell volume, Haemoglobin concentration, red blood cell counts and poor feed conversion than those fed other diets. Kidneys, pancreas and heart of the rabbits that were fed RBFM diet were larger ($p<0.05$) than those fed other diets. Cost/kilogram weight gain of the rabbits fed FBFM was lower than that of other diets. It was concluded that 25% FBFM can be included in grower rabbit diet to maximize growth and reduce production cost.

Key words: Carcass characteristics, digestibility, feed conversion ratio, feed intake, haematology and weight gain

INTRODUCTION

In commercial rabbit production, the use of concentrate feed inform of pellet is often necessary to achieve maximum potential of the animal most especially the breeding stock. The steady growth that is taking place in rabbit industry in Nigeria over the last one or two decades is creating food/feed crisis that is associated with poultry and pig production.

Breadfruit is an energy-rich fruit tree that has been successfully introduced to the forest, savanna and derived savanna regions of Nigeria. This tree with a good biomass yield is often produced in surplus between March and May, leading to heavy loss due to its inability to store for long (Amusa *et al.*, 2002). Breadfruit in the raw form can be processed into meal for poultry and rabbits to replace part of the maize in the diet (Oladunjoye *et al.*, 2010a; Oso *et al.*, 2010). It has been reported that raw breadfruit meal can only replace between 9 and 10% (about 30% maize) of the total diet for growing rabbit (Oladunjoye *et al.*, 2009; Oso *et al.*, 2010). The limitation impose on the use of breadfruit meal has been attributed to anti-nutritional factors (Oladunjoye *et al*., 2010a; Adekunle *et al*., 2006). Processing of breadfruit before making it into meal could be a way of reducing or eliminating anti-nutritional factors in the meal.

Various processing methods that have been successfully used to reduce or eliminate anti-nutritional factors in livestock feeds include sun-drying (Abdulrashid and Agwunobi, 2009), cooking (Emiola *et al*., 2007; Ravindran *et al*., 1996), fermentation (Ahamefule *et al*., 2006), toasting (Udedibie *et al*., 1994) and soaking (Olajide, 2012). Application of these methods to breadfruit could be a way of reducing or eliminating anti-nutritional factors in the meal thereby enhancing its nutritive value. This study was therefore, conducted to determine the effect of preparing breadfruit meal in raw, cooked and fermented form on its feeding value for the grower rabbits.

MATERIALS AND METHODS

Site of the experiment: The study was conducted at the Rabbitary Unit of Teaching and Research Farm of Ladoke Akintola University of Technology, Ogbomoso, Nigeria in the derived savanna zone of Nigeria between October and November, 2009. The study area is located between latitudes 8°07'N and 8°12'N and longitudes 4°04'E and 4°15'E. The mean annual rainfall is 1247 mm with relative humidity of between 75 and 95%. The location is situated at about 500 mm above the sea level with a mean annual temperature of 26.2°C.

Preparation of breadfruit meal: Breadfruits were plucked from breadfruit trees located within Ogbomoso township of Oyo State, Nigeria. The fruits were divided into three parts and processed as follows:

- **Raw breadfruit meal (RBFM):** The fruits were sliced into about 4 cm pieces and sun-dried for about 7 days until the product attained about 12% moisture content
- **Cooked breadfruit meal (CBFM):** The fruits were cut into four equal parts (Quartered) and then immersed in boiling water (100°C) for 30 min. This was drained, sliced into about 4 cm pieces and sun-dried as earlier described.
- **Fermented breadfruit meal (FBFM):** The fruits were cut into about 10 cm pieces, soaked in water at room temperature for 5 days until fermented and then sun-dried described earlier

The dried products were milled to obtain Raw Breadfruit Meal (RBFM), Cooked Breadfruit Meal (CBFM) and Fermented Breadfruit Meal (FBFM).

Experimental diets: Four rabbit grower diets (A, B, C and D) were formulated. Diet A served as the control with no breadfruit meal and contained 16.22% crude protein, 10.50 kcal kg^{-1} digestible energy and 11.02% crude fiber. Diets B, C and D contained 25% each of RBFM, CBFM and FBFM, respectively. All diets were adequate in protein, energy and fiber. The gross composition of the diets is presented in Table 1.

Rabbits and management: Sixty mixed sex, cross bred of New Zealand white and Flemish giant in their growing stage with average weight of 900±100 g were used for the study. The rabbits were divided into four groups of 15 rabbits each and the groups randomly assigned to any of the four diets in a Completely Randomized Design (CRD). Each experiment was replicated fifteen times

Table 1: Gross composition of experimental diets (%)

Ingredients	Control	RBFM	CBFM	FBFM
Corn bran	46.25	18.00	18.00	18.00
Breadfruit meal	0.00	25.00	25.00	25.00
Soybean meal	17.50	19.50	19.50	19.50
Wheat offal	7.00	12.25	12.25	12.25
Palm kernel meal	17.00	13.00	13.00	13.00
Rice husk	10.00	10.00	10.00	10.00
Bone meal	2.00	2.00	2.00	2.00
Common salt	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Determined analysis				
Crude protein (%)	16.22	16.00	16.00	16.01
Crude fiber (%)	11.02	10.26	10.28	10.31
Gross energy (MJ kg^{-1})	13.20	13.11	13.15	13.23
Digestible energy (MJ kg^{-1})	10.50	10.52	10.54	10.56
NDF (%)	32.95	33.85	33.92	33.98
ADF (%)	12.12	12.21	12.32	12.41

RBFM: Raw breadfruit meal, CBFM: Cooked breadfruit meal, FBFM: Fermented breadfruit meal, NDF: Neutral detergent fiber, ADF: Acid detergent fiber; *Calculated value (De Blas *et al*., 1992) DE = GE (0.867-0.0012ADF)

(each rabbit constitute a replicate). Rabbits were housed in individual hutches measuring 60×50×45 cm. Hutches were cleaned, disinfected and dried in the sun before the rabbits were moved in. Ivermectin was administered to get rid of ectoparasites and endoparasites before the commencement of the experiment. Rabbits were served pellet feed and water *ad libitum*. The study lasted for 56 days.

Data collection: Data was collected on feed intake, weight gain while efficiency of feed utilization was determined from feed intake and weight gain. Feed intake was estimated as the difference between feed served and the left over after 24 h period. Weight of the rabbits were taken at the beginning of the experiment and thereafter weekly and the difference in weight of an animal in two successive weeks taken as the weight gain for that week. Mortality record was collected and expressed as percentage of the animal at the commencement of the experiment.

Feed cost estimation: Feed cost was estimated from the cost of the ingredients used in feed preparation. Cost of various types of breadfruit meals were estimated from the farm gate price of breadfruit, cost of transportation, energy cost and cost of labour. Cost of feed consumed was determined from total feed consumed and feed cost. Cost per kilogram weight gain was determined from feed conversion ratio and feed cost.

Digestibility study: Digestibility trial was conducted at the end of the experiment using 10 rabbits per treatment. Five days of adjustment was given followed by five days collection period. Feed intake and faecal output were recorded. Faeces voided by each rabbit were collected daily, weighed and oven-dried at 60°C for 72 h. At the end of the study, faeces from each animal were pool together, milled and representative samples collected in sealed aluminum containers for laboratory analysis. Apparent digestibility of various nutrients (dry matter, crude protein, crude fiber, ether extract and nitrogen free extract) was calculated from the results of the proximate composition of feeds and faeces using the following formula:

$$\text{Composition (\%)} = \frac{\text{Nutrient intake-nutrient in the faeces}}{\text{Nutrient intake}} \times 100$$

Carcass analysis: Five rabbits per treatment were selected for carcass analysis. The rabbits were fasted for 24 h, stunned using electroshock method (Zotte, 2002) and bled by neck slit using sharp knife. The rabbits were eviscerated and the internal organs (liver, pancreas, heart and kidneys) carefully excised, clean of blood and weighed using electronic weighing scale. Weights of the skin and other organs were expressed as the percentage of the live weight of the animals. The carcass were cut into primal cuts as described by Blasco and Ouhayoum (1993), weighed and expressed as the percentage of the live weight of the animals.

Chemical analysis: Samples of RBFM, CBFM, FBFM, feeds and faeces were analyzed for moisture, crude protein, crude fiber, ether extract and ash according to the methods of AOAC (1990). Acid detergent fiber and neutral detergent fiber of RBFM, CBFM and FBFM were determined according to the method of Van Soest *et al.* (1991). The gross energy of RBFM, CBFM, FBFM, feeds and faeces were determined using ballistic bomb calorimeter. Calcium in the test ingredients was determined using a Perkin Elmer Model 2380 atomic absorption spectrophotometer after wet digestion of the samples. Phosphorus was determined using a spectrophotometric phospho-ammonium vanadate reaction described by Ravindran and Sivakanesan (1995). Tannin was extracted from the samples by the method of Hagerman and Butler (1978) while Follin-Denis method described by AOAC (1990) was employed to estimate tannic acid in the extract. Phytic acid was determined spectrophotometrically after enzymatic hydrolysis with phytase from *Aspergillus ficuum* (March *et al.*, 1995). Total oxalate was determined according to the method described by Yan *et al.* (2004).

Haemagglutinin extraction and determination of activity was carried out using the methods described by Hankins and Shannon (1978). Trypsin inhibitor extracts of the breadfruit meal samples were determined using the methods of Chan and De Lumen (1982), while activity was determined by the method of Kakade *et al.* (1974).

Blood samples collected from four animals per treatment into vacutainer tubes containing Ethylene Diamine Tetraacetic Acid (EDTA) were analyzed for haematological parameters. Packed Cell Volume (PCV) was determined by micro-haematocrit centrifugation method as described by Jain (1986). Red Blood Cells Counts (RBC) and White Blood Cells Counts (WBC) were determined using haemocytometer method (Jain, 1986). Haemoglobin concentration (Hb) was determined by cyanomethaemoglobin method of Kelly (1979) while MCV, MCH and MCHC were calculated from RBC, Hb and PCV (Jain, 1986).

Statistical analysis: Data collected were analyzed by One-way Analysis of Variance (ANOVA) using the General Linear Model (GLM) procedure of SAS (SAS, 1998). Significance was determined at $p<0.05$ and where significance was indicated, Least Significance Difference (LSD) option of the same software was used to separate the means.

RESULTS

The result of the chemical analysis of the test ingredients is presented in Table 2. The crude protein content obtained for RBFM, CBFM and FBFM in this study were 4.58, 4.46 and 4.38%, respectively while crude fiber were 5.23, 5.25 and 5.26%, respectively. Processing methods did not have marked effect on the percentage of crude protein and fiber fractions of breadfruit meals. Neutral detergent fiber ranged from 25.48% for FBFM to 25.80% for RBFM while acid detergent fiber was about 13.9% for all the breadfruit meal samples. All breadfruit meal samples contained oxalate, tannin and phytic acid irrespective of the processing method but at different levels. Generally their concentration was higher in the RBFM than in both cooked and fermented meal samples. Trypsin inhibitors and haemagglutinin were present in RBFM and FBFM but absent in CBFM.

The performance characteristics of the grower rabbits fed differently processed breadfruit meal is presented in Table 3. Rabbits that were fed FBFM (diet D) had significantly ($p<0.05$) higher final live weight, total weight gain and average daily weight gain than those fed control diet (diet A) but comparable values to those fed CBFM (diet C). The rabbits that were fed RBFM (diet B) however had lower ($p<0.05$) values than those fed other diets (diets A, C and D) with respect to the same parameters. Feed consumed by rabbits that were fed control, CBFM and FBFM diets were similar

Table 2: Chemical composition of the test ingredients on dry matter basis

Component	RBFM	CBFM	FBFM
Crude protein (%)	4.58	4.46	4.38
Crude fiber (%)	5.23	5.25	5.26
Ether extract (%)	2.50	2.62	2.43
Ash (%)	3.80	3.72	3.68
Nitrogen free extract (%)	83.89	83.95	84.25
Neutral detergent fiber (%)	25.80	25.20	25.48
Acid detergent fiber (%)	13.88	13.86	13.85
Gross energy (MJ kg^{-1})	15.82	15.62	15.32
Digestible energy (MJ)	10.78	10.95	10.74
Calcium (%)	0.06	0.05	0.04
Phosphorus (%)	0.15	0.12	0.11
Oxalate (%)	2.0×10^{-6}	1.25×10^{-6}	1.22×10^{-6}
Tannin (%)	5.12×10^{-3}	4.22×10^{-3}	3.85×10^{-3}
Phytic acid	7.5×10^{-2}	5.2×10^{-2}	2.50×10^{-2}
Trypsin inhibitors (TIU mg^{-1})	18.22	0.00	5.52
Haemagglutinin (HU mg^{-1})	10.25	0.00	2.80

RBFM: Raw breadfruit meal, CBFM: Cooked breadfruit meal, FBFM: Fermented breadfruit meal

Table 3: Performance characteristics of the rabbits

Parameter	Control	RBFM	CBFM	FBFM	SEM
Initial weight (kg)	0.90	0.91	0.90	0.89	0.20
Final weight (kg)	1.76^{b}	1.63^{c}	1.79^{ab}	1.81^{a}	0.04
Total weight gain (kg)	0.86^{b}	0.72^{c}	0.89^{ab}	0.92^{a}	0.04
Average daily gain (g)	15.38^{b}	12.82^{c}	15.86^{ab}	16.36^{a}	0.80
Average daily feed intake (g)	64.81^{ab}	59.40^{b}	63.26^{ab}	67.36^{a}	6.00
Feed conversion ratio	4.22^{b}	4.62^{a}	4.32^{b}	4.10^{b}	0.25
Mortality	0.13	0.22	0.11	0.12	0.15
Feed cost (N kg^{-1})	38.20	38.42	38.40	38.22	2.00
Cost of feed consumed (N)	138.20^{b}	127.80^{d}	136.03^{c}	144.17^{a}	4.00
Cost/kg weight gain (N)	161.20^{c}	177.50^{a}	165.89^{b}	156.70^{d}	3.00

Means with different superscripts along the same row are significantly different at $p<0.05$, RBFM: Raw breadfruit meal, CBFM: Cooked breadfruit meal, FBFM: Fermented breadfruit meal but were higher than those fed RBFM diet. Rabbits that received RBFM diet had poor feed conversion than those fed other diets (diets A, C and D) as reflected by their higher ($p<0.05$) feed conversion ratio. No significant ($p>0.05$) difference was observed in the mortality and cost of feed. Cost of total feed consumed was lowest ($p<0.05$) in diet B, followed by diet C, A (control) and D in that order. Cost per kilogram weight gain was however reversed with diet D having the lowest ($p<0.05$), followed by diet A (control), C and B in that order.

Apparent nutrient digestibility of the grower rabbits fed differently processed breadfruit meal is presented in Table 4. Dry matter digestibility is similar in rabbits fed control, CBFM and FBFM but lower ($p<0.05$) in those fed RBFM. Digestibility of dry matter, ether extract and nitrogen free extract is similar in the rabbits fed the control, CBFM and FBFM but significantly ($p<0.05$) lower than those fed RBFM. Crude protein digestibility was higher ($p<0.05$) in rabbits fed FBFM than those fed control and RBFM. Those that received FBFM and CBFM were however comparable. Non significant difference was observed in the crude fiber digestibility.

The carcass characteristics and organ weight of grower rabbits fed differently processed breadfruit meal is presented in Table 5. Rabbits that received fermented breadfruit meal in their diets had significantly ($p<0.05$) larger live weight, carcass weight, dressing percentage, hind limb and breast than those fed control and RBFM. Rabbits that were fed CBFM and FBFM were however comparable with respect to those parameters except dressing percentage. Also, values that were obtained for the rabbits fed RBFM were consistently lower ($p<0.05$) than those fed other diets in aforementioned parameters. Weights of the fore limbs and lumber region of the rabbits that were fed FBFM, CBFM and the control diets were similar but higher ($p<0.05$) than those fed RBFM diet.

Table 4: Apparent nutrient digestibility of the rabbits

Parameter	Control	RBFM	CBFM	FBFM	SEM
Dry matter	63.70^{a}	61.50^{b}	64.60^{a}	64.80^{a}	1.50
Crude protein	70.30^{b}	67.98^{c}	70.92^{ab}	72.10^{a}	1.40
Crude fiber	57.00	56.06	56.50	56.20	1.20
Ether extract	73.80^{a}	70.81^{b}	73.11^{a}	72.58^{a}	1.50
Nitrogen free extract	74.85^{a}	72.20^{b}	75.50^{a}	76.20^{a}	1.10

Means with different superscript along the same row are significantly different at $p<0.05$, RBFM: Raw breadfruit meal, CBFM: Cooked breadfruit meal, FBFM: Fermented breadfruit meal

Table 5: Carcass characteristics and organ weight of the rabbits

Parameter	Control	RBFM	CBFM	FBFM	SEM
Live weight (kg)	1.63^{b}	1.55^{c}	1.68^{ab}	1.71^{a}	0.06
Carcass weight (g)	964.96^{b}	900.86^{c}	999.60^{ab}	1044.81^{a}	50.00
Dressing percentage (% LW)	59.20^{b}	58.12^{c}	59.50^{b}	61.10^{a}	0.70
Skin (%)	9.65	9.41	9.62	9.21	0.60
Hind limb (% LW)	13.20^{b}	10.95^{c}	13.85^{ab}	14.52^{a}	1.00
Fore limb (% LW)	11.92^{a}	9.10^{b}	11.96^{a}	10.65^{a}	1.40
Lumbar region (% LW)	13.62^{a}	11.56^{b}	13.92^{a}	13.98^{a}	0.70
Breast (% LW)	8.41^{b}	7.34^{c}	8.97^{ab}	9.52^{a}	0.80
Liver (% LW)	2.62^{b}	3.14^{a}	2.82^{b}	2.75^{b}	0.27
Pancreas (% LW)	0.24^{b}	0.38^{a}	0.25^{b}	0.27^{b}	0.07
Heart (% LW)	0.26^{b}	0.39^{a}	0.28^{b}	0.27^{b}	0.06
Kidneys (% LW)	0.81	0.86	0.84	0.83	0.10

Means with different superscripts along the same row are significantly different at $p<0.05$, RBFM: Raw breadfruit meal, CBFM: Cooked breadfruit meal, FBFM: Fermented breadfruit meal, LW: Live weight

Table 6: Haematological characteristics of the rabbits

Parameter	Control	RBFM	CBFM	FBFM	SEM
Packed cell volume (%)	55.00[a]	49.00[b]	54.00[a]	53.00[a]	3.0
Haemoglobin concentration (g dL^{-1})	15.10[a]	11.30[b]	14.30[a]	13.85[a]	2.0
Red blood cells counts ($\times 10^6$ m^{-3})	3.30[a]	2.70[b]	3.50[a]	3.40[a]	1.0
White blood cells counts ($\times 10^3$ m^{-3})	5.00	4.90	5.10	5.00	1.0
MCV (fl)	85.12	84.72	85.33	83.95	3.0
MCH (pg)	29.11	28.43	30.10	30.32	2.8
MCHC (g dL^{-1})	31.20	30.80	31.90	32.10	2.2

Means with different superscripts along the same row are significantly different at $p<0.05$, RBFM: Raw breadfruit meal, CBFM: Cooked breadfruit meal, FBFM: Fermented breadfruit meal, MCV: Mean cell volume, MCH: Mean cell haemoglobin, MCHC: Mean cell haemoglobin concentration

Weights of the kidneys, pancreas and the heart of the rabbits fed RBFM were significantly ($p<0.05$) higher than those fed control, CBFM and FBFM diets. No significant difference was observed in the weight of the skin and liver of the rabbits.

The haematological characteristic of the rabbits is shown in Table 6. Packed cell volume, haemoglobin concentration and red blood cell counts of the rabbits fed control, CBFM and FBFM diets were similar but were higher ($p<0.05$) than the corresponding values obtained for the group fed raw breadfruit meal diet. Non significant effect of diet was however observed in WBC, MCV, MCH and MCHC, respectively.

DISCUSSION

The values obtained for crude protein and crude fiber in this study agree with that of Ravindran and Sivakanesan (1995) but lower than the values reported by Oso *et al*. (2010). The difference could be due to cultivar difference or stage of maturity of the fruits at the time of harvesting. The values obtained for NDF and ADF in RBFM, CBFM and FBFM agree with that of Oso *et al*. (2010) which imply that processing methods has no effect on this fraction of the meals. The presence of oxalate, tannin and phytic acid in RBFM, CBFM and FBFM is in line with the report of Oladunjoye *et al*. (2010b) who also reported the presence of these compounds in raw, cooked and soaked breadfruit meal samples. However, the fact that these compounds were reduced in CBFM and FBFM suggests the need for either cooking or fermentation before breadfruit is prepared into a meal for rabbit. The absence of haemagglutinin and trypsin inhibitors in the CBFM samples also agrees with the report of the same authors that cooking is effective way of eliminating these compounds in breadfruit meal. This indicates the need for proper cooking of breadfruit before it can be prepared as meal for non ruminant animal or eaten by man.

The depression in the weight gain of the rabbits fed RBFM in this study can be attributed to anti-nutritional factors which probably reached a threshold level beyond the tolerance level of the animals. Liener and Kakade (1980) had earlier reported that the presence of protease inhibitors in the raw legumes is in part responsible for growth inhibition and pancreatic hyperplasia in monogastric animals. Uchegbu *et al*. (2004) also attributed the depression in the growth of broilers fed high level of raw *Napoleona imperialis* seed meal to anti-nutritional factors. The fact that rabbits fed FBFM and CBFM performed better than those fed RBFM in terms of weight gain indicates that using these methods for processing breadfruit for rabbits have some beneficial effects which can be attributed to the reduction or complete elimination of the anti-nutritional factors in FBFM and CBFM (Oladunjoye *et al*., 2010b; Bhandari and Kawabata, 2006; Adekunle *et al*., 2006). Reduced feed intake that was observed in diet B can also be attributed to anti-nutritional factors in raw breadfruit meal. Tannin is known to reduce palatability, feed intake, feed digestibility and efficiency of production due to their astringent taste and tendency to precipitate and bind protein (Cornel University Department of Animal Science, 2008).

Poor feed conversion and low nutrient digestibility recorded in the rabbits that were fed RBFM can also be attributed to anti-nutritional factors. Zarkadas and Wiseman (2005) also reported a reduction in the efficiency of feed utilization when diets containing trypsin inhibitors was fed to monogastric animal.

Larger kidneys, pancreas and heart that were observed in rabbits fed RBFM can also be attributed to anti-nutritional factors (Ologhobo *et al.*, 2003) possibly trypsin inhibitors and haemagglutinin. Inactivation of trypsin by trypsin inhibitor is known to elicit continuous release of cholecystokinin which stimulates pancreatic production of digestive enzymes including trypsin and chymotrypsin leading to enlargement of pancreas as a result of hypertrophy and hyperplasia (Liener, 1989).

The reduction observed in carcass yield and prime cuts of the rabbits fed RBFM can be attributed to low quality and poor utilization of the diets (Bamgbose and Niba, 1998) probably occasioned by anti-nutritional factors in the diet. The dressing percentage obtained in this study was higher than that reported by Elamin *et al.* (2012) for the local breed of rabbits fed on different sources of fodders in Sudan. This could however be due to difference in weight or breed or age or combination of these.

The low PCV, RBC and Hb that was observed in the rabbits fed RBFM can be attributed to the negative effect of anti-nutritional factors on the digestibility and utilization of protein in the diet. Pellet and Young (1980) has demonstrated the existence of positive correlation between erythrocyte and haemoglobin concentration and quantity and quality of protein in the diet. The fact that the same parameters were similar in the control diet and CBFM and FBFM indicates that the protein quality of the diets was not compromised.

The lowest production cost that was obtained in the rabbits fed FBFM in this study indicates that more profit can be made by including 25% FBFM in the diets of rabbit at this age.

CONCLUSIONS

The results obtained in this study revealed that subjection of breadfruit to cooking and fermentation before preparing it into meal reduce the concentration of oxalate, tannin and phytic acid in the meal. Cooking completely eliminates trypsin inhibitors and haemagglutinin in the meal. Inclusion of 25% FBFM in grower rabbit diet improves growth and reduce production cost while addition of the same amount of RBFM depress growth and increase cost.

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