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Effect of Different Processing Techniques of Kenaf Grain Meal in The Diets of Rabbits

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ABSTRACT: *Kenaf grain is rich in protein and energy but there is need for further processing for maximum utilization by livestock. Feed processing has been found to improve feed intake, weight gain and nutrient digestibility. A total of forty-eight crosses of Chinchilla and white California weaned rabbits of mixed sexes of mean weight 543.45±3.6g were used for the feeding trial that lasted for 90 days. Kenaf grain was processed by three different methods before incorporation with other feed ingredients. Four diets were formulated in which kenaf grain was not processed which served as Control (P1), Diet 2 (P2), Roasting of KG, Diet 3 (P3), Soaking of KG in water for 24 hours before air-drying, Diet 4 (P4), Cooking of KGM with water for 10 minutes before air-drying. The diets were formulated to contain 16% crude protein and energy of 2600kcal Metabolizable Energy/kg. Data were collected on feed intake, weight gain, feed conversion ratio and nutrient digestibility among others. The feed intake was significantly higher in P2, P3 and P4 containing roasted soaked and cooked kenaf grain meal as compared to diet containing unprocessed kenaf grain meal (P<0.05). The weight gain of the rabbits improved when KGM was roasted, cooked or soaked before incorporated with other feed ingredients (P<0.05). The efficiency of feed utilization was relatively similar in the diets containing processed kenaf grain meal. The crude protein and crude fibre digestibility were lowered at P1 containing diet with raw KGM (P>0.05). The results of carcass analysis showed that the dressed weight and dressing percentage were better in the diet containing processed KGM. It could be concluded that processing of kenaf grain meal by roasting, soaking and blanching improved feed intake, nutrients digestibility, weight gain and dressing percentage of rabbits.*

KEYWORDS: kenaf, digestibility, Feed ingredients, feed utilization

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INTRODUCTION

Feeds constitutes about 60-70% of total cost of production in livestock production and growth performance of livestock depend largely on quality and quantity of feed given (Babatunde *et.al*., 2001 and Fanimo, and Oduronbi (2006). The major limitation to the use of alternative feed resource such as kenaf grain meal is the presence of anti-nutritional factors (Soetan and Oyewole 2009). Anti-nutritional factors may occur naturally, such as glucosinolates in mustard and ripe seed protein products, trypsin inhibitors and haemagglutinnins in legumes, tanins in legumes and cereals, phytates in cereals and oil seeds and gossypol in cotton seed protein products. The presence of high levels of tannins in cereals can result in significantly reduced protein and amino acid digestibilities up to 23% in rats, poultry and pigs (Gilani *et al*, 2005; Soetan, 2008). There are physical and chemical methods employed to reduce or remove anti-nutritional factors such as soaking, cooking, germination, fermentation, selective extraction, irradiation and enzymic treatment (Dawra, *et al.,*1988, Aletor 1991). Industrial processes such as canning, toasting, fractionation and isolation of protein concentrates have also been shown to be effective in reducing or removing anti-nutritional factors. It has been noted that processing can introduce undesirable compounds such as volatile aldehydes and ketones and perioxide as direct of lipid oxidation or reduce levels of desirable compounds e.g. protein and essential minerals (Soetan and Oyewole 2009). It was also established that thermal treatment was most effective in improving protein and starch digestibilities when compared with dehulling, soaking and germination. Soetan and Oyewole,2009 concluded that heat treatment partially or wholly broke down anti-nutritional factors and determined constituents such as fats also become better accessible, whereby the nutritional value of the final animal feed increases. Roasting and autoclaving significantly reduced the tannin and typsin inhibitor by 23.05 and 12.09% respectively (Ogundipe *et al* 2003). It was also established that decrease in phytic acid contents by soaking, cooking of beans could be due to leaching out of this compound in water (Gilani *et al*, 2005). Cooking lablab bean-seed for about 30 minutes gave the best results in term of final weight, feed consumption and feed-gain ratio (Ogundipe *et al* 2003). Roasting greatly lowered the level of trypsin inhibitor-activity compared to boiling Omoruyi *et al* 2007. Kenaf grain contains anti-nutritional factors such as saponin and tannins which limits its digestibility, absorption and utilization by livestock hence this study was conducted to assess the effect of different processing methods mentioned above on weight gain, feed intake feed utilization, dressing percentage and nutrients digestibility of weaned rabbits.

METHODOLOGY

The experiment was carried out at the Rabbitary Unit of the Institute of Agricultural Research and Training (I.A.R.& T.), Moor Plantation, Ibadan which is located on

Longitude 03°51E, Latitude 07°23N and Altitude 650" lies in the humid zone of the rainforest belt 0703.25 of Southwestern Nigeria with mean annual rainfall of 1220 mm and mean temperature of 26°C. A total of forty eight crosses of Chinchilla and white California weaned rabbits of mixed sexes of mean weight 543.45±3.6g were used for the feeding trial that lasted for 90 days. The rabbits were acclimatized for one week before the commencement of the feeding trial. Kenaf grain was purchased from kenaf Improvement Programme of the Institute of Agric. Research and Training Ibadan. The Kenaf grain was processed by three different methods.

(i) Control (No processing)
(ii) Roasting of KGM
(iii) Soaking of KGM in water for 24 hours before air-drying
(iv) Cooking of KGM with water for 10 minutes before air-drying

Forty-eight (48) weaned rabbit were allotted to four different processing groups as stated above in a complete randomized design. Each treatment was replicated three times with four rabbits per replicates. Diets were formulated to contain the same proportion of processed and unprocessed KGM and the diets. The diets were formulated to contain 16% crude protein and energy of 2600kcalME/kg. Feed intake was measured on daily basis with the use of weighing balance. The weight gain was obtained by deducting the initial weight from final weight. The weight was measured on weekly basis with the use of weighing balance. The feed conversion ratio was calculated as the ratio of feed intake to weight gain. Feed cost and cost per weight gain were also calculated. Four rabbits were randomly selected from each treatment and housed individually. Feaces and urine were collected on daily basis, weighed and stored inside refrigerator. Seven days were used for the collection. At the end of seven days, the feacal was bulked for each animal for proximate analysis and the urine was bulked for nitrogen analysis. Six rabbits from each of the treatments were randomly selected for carcass analysis. The rabbits were starved overnight, weighed and slaughtered. The fur, intestine, lung, kidney and heart to the dressed weight were calculated. Proximate composition of the feed and faeces were carried out according to the method of A.O.A.C, 1990. All data were subjected to analysis of variance using SAS, 1995.

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Table 1: Gross Composition of the Experimental Diet.

Ingredient (%)	P_1	P_2	P_3	P_4
Maize	32.0	32.0	32.0	32.0
Kenaf grain meal	16.0	16.0	16.0	16.0
*Others	52.0	52.0	52.0	52.0
Total	**100.0**	**100.0**	**100.0**	**100.0**
Calculated Composition				
Crude protein (%)	16.13	16.13	16.13	16.13
Metabolizable energy (kcal/KgME)	2628.1	2628.1	2628.1	2628.1

*Other fixed ingredients: Wheat offal-20, BDG, 20, Fish meal-0.5, Soya bean meal-5.55, Bone meal-1.50, Oyster shell-4.2, Premix-0.25.

P_1- control, P_2- Roasting P_3- Soaking P_4- Cooking

Table 2 : Proximate Composition of the kenaf grain and Experimental diets

Parameters	**KGM_1**	**KGM_2**	**KGM_3**	**KGM_4**	**P_1**	**P_2**	**P_3**	**P_4**
Dry Matter	96.47	94.67	95.32	95.77	93.76	94.32	9412	94.80
Crude Protein	39.45	38.11	38.78	38.04	15.78	15.59	15.58	15.56
Crude Fibre	10.56	9.78	10.05	9.67	12.10	11.45	11.36	11.22
Ether Extract	5.78	5.78	5.64	5.32	4.45	4.43	4.45	4.55
Ash	9.38	9.05	9.01	9.11	8.23	8.19	8.15	8.14
Nitrogen Free Extract	34.83	37.28	36.52	37.86	59.44	60.34	60.46	60.53

P_1- Control diet, P_2- Roasting P_3- Soaking P_4- Cooking KGM_1- Raw, KGM_2, KGM_3, KGM_4

Table 3: Performance of weaned rabbit fed different levels of processed Kenaf grain meal.

Parameters (Means)	P_1	P_2	P_3	P_4	± SEM
Total feed intake (g)	6880.5^{b}	7515.0^{a}	7506.0^{a}	7512.3^{a}	20.45
Daily feed intake (g)	76.45^{b}	83.5^{a}	83.4^{a}	83.47^{a}	4.2
Initial weight (g)	547.1	548.33	546.15	545.79	4.87
Final weight (g)	1826.0^{b}	2283.5^{a}	2265.4^{a}	2290.89^{a}	29.89
Total weight gain (g)	1278.9^{b}	1735.2^{a}	1718.1^{a}	1745.1^{a}	28.34
Daily weight gain (g)	14.21^{b}	19.28^{a}	19.09^{a}	19.39^{a}	2.76
Feed conversion ratio	5.38^{a}	4.33^{b}	4.37^{b}	4.31^{b}	0.21

Means along rows with different superscript are significantly different from each other ($P<0.05$)

P_1- control, P_2- Roasting P_3- Soaking P_4- Cooking

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Table 4. Nutrients digestibility of weaned rabbits fed experimental diets in percentage

Parameters (Means)	P_1	P_2	P_3	P_4	± SEM
Dry matter dig.	74.49 [b]	77.48 [a]	77.89 [a]	78.88 [a]	2.34
Crude protein dig.	55.34 [b]	69.67 [a]	69.89 [a]	70.34 [a]	2.45
Crude fibre dig.	63.21 [b]	66.45 [a]	67.12 [a]	67.59 [a]	2.21
Ether extract dig.	60.34 [b]	62.78 [a]	63.12 [a]	63.65 [a]	2.11
Ash dig.	64.45 [b]	67.81 [a]	68.88 [a]	69.98 [a]	2.5

Means along rows with different superscript are significantly different from each other (P<0.05)

Table 5 Carcass analysis of weaned rabbit fed different levels of processed Kenaf grain meal.

Parameters (Means)	P_1	P_2	P_3	P_4	± SEM
Live-weight (g)	1826.68 [b]	2275.6 [a]	2280.5 [a]	2287.34 [a]	33.4
Dressed weight	1343.34 [b]	1736.05 [a]	1740.2 [a]	1747.27 [a]	25.8
Dressing %	73.54 [a]	76.29 [a]	76.31 [a]	76.39 [a]	3.13
Heart weight %	0.76	0.77	0.78	0.78	0.11
Liver weight %	2.69	2.76	2.72	2.78	0.23
Lung weight %	1.83	1.85	1.85	1.87	0.17

Means along rows with different superscript are significantly different from each other (P<0.05)

P_1- control, P_2- Roasting P_3- Soaking P_4- Cooking

RESULTS AND DISCUSSION

As observed in table 2, the crude protein and crude fibre of raw kenaf grain meal (RKGM) were slightly higher than other processed grain meal. Loss of nutrients through heat effect on the grains could be responsible for the reduction in crude protein and crude fibre content of the processed kenaf grain. Dawra, *et al.*,1988, Aletor 1991 and Omoruyi *et al.*,2007 observed that there were decrease in protein and fibre content of a feed when heat treatment is applied because some nutrients may be lost or denatured. The weight gain of the rabbits improved when KGM was roasted, cooked or soaked before incorporated with other feed ingredients (P<0.05) table 3. The weight gain of 14.21g was reported in rabbit fed diet containing raw kenaf grain meal as observed in table 3 while the weight gain increased in P2, P3, and P4. The feed intake was significantly higher in P2, P3 and P4 containing roasted soaked and cooked kenaf grain meal as compared to diet containing unprocessed kenaf

grain meal (P<0.05). The better feed intake reported fin P2, P3 and P4 over P1 could be due to better taste and reduction in fibre content of the feed. The feed was better utilized in P2, P3 and P4 than P1 (P<0.05). The efficiency of feed utilization as shown in table 3 was relatively similar in the diets containing processed kenaf grain meal. The feed conversion ratio of 5.38 was recorded in P1 while 4.33, 4.37 and 4.31 were recorded in P2, P_3 and P_4 respectively (P>0.05). The improvement in performance of rabbit fed diet containing processed KGM over those that fed raw KGM could be attributed to better taste of the feed, reduction in fibre content of the feed and better nutrients digestibility. Presence of tannin in the feed decreased feed consumption in animal, bind dietary protein and digestive enzymes to form complexes that are not readily digestible (Reddy *et al.*,1985, Omoruyi, 2007, Ogundipe, 2003) and they also cause decreased palatability and reduced growth rate. The crude protein and crude fibre digestibility were lowered at P1 containing diet with raw KGM (P>0.05). There is positive correlation between digestibility of nutrients and growth performance of livestock. Also, the higher the feed consumption, the better the nutrients digestibility. The reduction in nutrients digestibility could be due to reduction in feed intake and presence of anti-nutritional factors such as tannin and saponnin present in raw kenaf grain meal as shown in table 4. Anti-nutritional factors mentioned above have been found to reduce nutrient digestibility and utilization. Gilani *et al*, 2005 confirmed that the presence of high levels of tannins in cereals resulted in significantly reduced protein and amino acid digestibilities up to 23% in rats, poultry and pigs. The results of carcass analysis table 5, showed that the dressed weight and dressing percentage were better in the diet containing processed KGM compared to the one with unprocessed KGM although significant differences were not observed in rabbit fed diet containing the three-processing method. The dressing percentage of 73.54 was recorded in P_1 while 76.29, 76.31 and 76.39 was recorded in P_2, P_3 and P_4 respectively. Processing of feed by cooking, roasting, blanching and toasting have been found to improve taste, general acceptability, carcass yield or dressing percentage better (Soetan2008 ; Soetan and Oyewole 2009) The dressing percentage reported in P_2, P_3 and P_4 compared favourably with the report of Babatunde *et.al*., 2001 and Fanimo, and Oduronbi (2006) and Omole *et al*, 2007. It could be concluded that processing of kenaf grain meal improved feed intake, nutrients digestibility, weight gain and dressing percentage of rabbits.

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