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Effect of Replacing Wheat Offal with Millet Offal on the Growth Performance and Digestibility of Growing Rabbits

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ABSTRACT

This study was carried out to evaluate the effect of feeding graded levels of millet bran on the performance of growing rabbits. A total of 25 rabbits (Dutch x New Zealand White) between 5 and 7 weeks of age with average initial weight of 515.80 g were randomly allocated to five dietary treatments containing 0, 7.25, 14.50, 21.75 and 29% millet bran (MB) in diets (treatments) 1, 2, 3, 4 and 5 respectively. The MB replaced wheat offal weight for weight. Each treatment has five rabbits that were housed in individual cages. The experimental diets were served *ad libitum*. Results obtained after the 49–day trial revealed no significant differences ($p>0.05$) in the daily weight gain and feed conversion ratio among the treatment groups. Although the feed intake differed significantly ($p<0.05$) no discernable pattern was observed. Similarly, there were no significant differences ($p>0.05$) in digestibility of the dry matter, crude protein, crude fat, ash and nitrogen-free extract. Only crude fibre digestibility was significantly different ($p<0.05$) among the treatment groups. The results of this study show that 100% of the wheat offal in the diets of growing rabbits could be replaced with millet bran without deterioration in performance.

Key words: Millet bran, wheat offal, performance, rabbit, digestibility

INTRODUCTION

The production and supply of animal protein is greatly influenced by feed availability throughout the year. Feed accounts for about 65–70% of the cost of livestock and poultry production (Nworgu *et al*., 1999, Oluyemi and Roberts, 2000). This is because of the competitive demand from man, industry and farm animals in the use of the conventional feedstuffs like cereal grains (Igwebuike *et al*., 1995).

The production of rabbits would be increased in Nigeria if cheaper feedstuffs that are readily available could be used in their diets since rabbits have the potential of utilizing unconventional feedstuffs like the agricultural and industrial by-products that abound in Nigeria (Igwebuike *et al.,* 1995). Thus, there is the need to evaluate alternative feeding materials like millet bran that could be relatively less expensive, readily available and with great potential in supporting livestock growth.

The aim of this study therefore was to determine the effect of inclusion of the various levels of millet bran on the growth and nutrient digestibility of young rabbits.

MATERIALS AND METHODS

Experimental animals and management

Twenty-five rabbits of mixed breeds (Dutch X New Zealand white) of both sexes, aged between 5 and 7 weeks were used for the study. The initial average weight of the rabbits was 515.80 g, They were randomly allotted in groups of five to each of the five diets. Each rabbit was housed in individual cages measuring 33 × 38 × 45 cm in which they were served with the experimental diets for 8 weeks. The rabbits were allowed to adjust to the experimental condition in the first week while data were collected for the remaining seven weeks.

Experimental diets

The experimental diets were formulated using locally procured ingredients (Table 1); millet bran (MB) was included in the diets at 0 (control), 7.25, 14.50, 21.75 and 29% in Treatments 1, 2, 3, 4 and 5 respectively. The MB

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replaced wheat bran weight for weight. Clean drinking water and the experimental diets were provided *ad libitum*.

Parameters measured

Daily feed intake was measured by subtracting the left over from the total feed given to the rabbits per head per day. Live weight change was determined by the difference in weight from the previous week, while feed conversion ratio was calculated as the ratio of the feed intake to weight gain. The proximate analysis of the diets and faecal samples were determined according to AOAC (1990) methods.

Digestibility trial was conducted by the collection of faeces from the rabbits during the last five days of the experiment after feeding known quantities of feed. The faecal samples were allowed to air-dry and weighed. The air-dried samples were later oven-dried and used for chemical analysis and subsequent determination of digestible nutrients using the formula:

$$AD = \frac{\%\ \text{nutrient in feed} \times Fl - \%\ \text{nutrient in faeces} \times FO}{\%\ \text{nutrient in feed} \times Fl} \times 100$$

where, AD = apparent digestibility (%); Fl = feed intake (on dry matter basis); FO = faecal output (on dry matter basis).

Table 1. Composition of the experimental diets (treatments)

Ingredients (%)	Treatments /diets				
	T_1	T_2	T_3	T_4	T_5
Maize	40.35	40.35	40.35	40.35	40.35
Wheat offal	29.00	21.75	14.50	7.25	0.00
Millet bran	0.00	7.25	14.50	21.75	29.00
GNC	25.00	25.00	25.00	25.00	25.00
Fishmeal	3.00	3.00	3.00	3.00	3.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Salt	0.05	0.05	0.05	0.05	0.05
Premix*	0.15	0.15	0.15	0.15	0.15
Total	100.00	100.00	100.00	100.00	100.00

GNC = groundnut cake; * Premix by Animal Care (Trade mark) contains the following per kg: Vit. D_3, 3,000,000 IU; Vit. E, 30,000 IU; Vit. K, 2,500 mg; Thiamine, B_1 2,000 mg; Riboflavin (B_2), 6000 mg; pyridoxine (B6), 400 mg; Niacin 4,000 mg;Vit B_{12} 20 mg; pantothenic acid, 10,000 mg; folic acid, 100 mg; Biotin 80 mg; choline chloride, 500 mg; anti-oxidant 125 g; manganese, 96 g; zinc, 60 g; iron, 240 g; copper, 6 g; iodine, 4 g; selenium, 24 mg; cobalt, 240 mg

Statistical analysis

All data were subjected to analysis of variance (ANOVA) using randomized complete block design (Steel and Torrie, 1980). Means were separated, where applicable, using the least significant difference (LSD) as outlined by Steel and Torrie (1980).

RESULTS AND DISCUSSION

The chemical composition of the experimental diets is presented in Table 2. The diets were formulated to meet the nutrient requirements of growing rabbits in the tropics.

The crude protein content of the diets (16.39 to 17.65%) were adequate for growing rabbits. This range is comparable with the crude protein level of 16 - 18% reported by NRC (1977) and Adegbola (1991). The crude fibre levels of the diets (9.50 to 12.50%) were lower than 14% recommended by Anugwa *et al.* (l982) and 12 to 18% reported by Adegbola *et al.* (1985) but similar to 11-15% reported by Igwebuike *et al.* (1991). It also falls within the range of 9.00 to 14.00% reported by Cheeke (1983). The crude fat of the diets (3.50 to 4.00%) is ideal for growing rabbits. The level is enough to provide essential fatty acids and maintain glossy sleek hair as reported by Cheeke (1974) and falls within the range of 2.0 to 5.0% reported by Bivin *et al.* (1968), but far lower than the 10 to 20% reported by Thacker and Brandt (1955).

The mean daily feed intake, live weight gain and feed conversion ratio are presented in Table 3. The daily feed intake showed significant differences ($p<0.05$) among treatments but there was no discernable pattern. The feed intake of rabbits in diets 1, 3 and 5 were higher than the other treatments. The result agrees with the observations of other workers (Pote *et al.*, 1980; Harris *et al.*, 1983; Onifade and Tewe, 1993) who fed similar diets in mash form to young rabbits.

Table 2. Chemical composition of the experimental diets, millet bran (MB) and wheat bran (WB)

Ingredients (%)	Treatments/diets						
	T_1	T_2	T_3	T_4	T_5	MB	WB*
Dry matter	93.70	93.80	94.80	89.10	94.70	93.30	-
Crude protein (CP)	17.80	16.39	16.57	16.78	16.65	16.22	16.18
Crude fibre (CF)	9.50	10.50	10.69	11.50	12.50	18.50	11.90
Ether extract (EE)	4.00	3.59	3.62	3.51	3.50	4.50	4.00
Ash	5.50	6.50	7.50	7.50	7.50	11.50	5.12
NFE	64.20	63.93	62.22	66.85	58.81	40.72	63.70
ME (Kcal/kg)	3261.70	3161.07	3115.12	3278.35	2988.81	2410.20	-

NFE = nitrogen-free extract; ME = metabolizable energy = calculated according to the formula of Pauzenga (1985): ME=37x% CP+81 x % EE + 35.5 x % NFE; *WB = wheat bran (analysed by Alade *et al.* (2002)

Table 3. Effects of feeding graded levels of millet bran on the performance of young rabbits

Parameters	Treatment/diets					
	T_1	T_2	T_3	T_4	T_5	SEM
Level of MB (%)	0	7.25	14.50	21.75	29.00	NAS
No. of Rabbits	5	5	5	5	5	NAS
Initial body wt (g)	514.00	520.00	517.00	514.00	514.00	99.51^{NS}
Final body wt (g)	1170.00	1067.00	1254.00	1210.00	1220.00	93.80^{NS}
Mean weight gain (g/rabbits/day)	13.39	13.73	14.84	14.21	14.10	5.14^{NS}
Mean feed intake (g/rabbits/day)	42.86^{a}	37.20^{b}	41.77^{a}	35.18^{b}	42.50^{a}	2.03^{*}
Feed conversion ratio	3.71	3.59	3.85	3.95	3.01	1.35^{NS}
Mortality (number)	0	1	0	0	0	NAS

NAS = not analyzed statistically; SEM = standard error of mean; a,b = means in the same row bearing different superscripts differ significantly ($p<0.05$); NS = not significant ($p>0.05$)

The result of the live weight gain is presented in Table 3. There was no significant difference ($p>0.05$) in live weight gain. The average daily weight gain (13.39 to 14.84 g/day/rabbit) obtained in this study compared favourably with the work of Uko *et al.* (2001) who reported weight gain of 12.60 to 16.90 g/day/rabbit for rabbits fed cereal by-products.

The result of the final weight gain and feed conversion ratio followed the same trend with the live weight gain and were not significantly different ($p>0.05$) among the treatment groups. These results agreed with the findings of Onifade and Tewe (1993) and Uko *et al.* (2001). However, the results of the feed conversion ratio obtained in this study were superior to those reported by Abu and Ekpenyong (1993) and Onifade and Tewe (1993) for rabbits reared in tropical climate and fed on mash concentrate diets. The result suggests that millet bran can replace wheat bran in the diet of young rabbits without adverse effects on weight gain and feed conversion ratio. One death was recorded in treatment 2 (Table 3). Post mortem examination revealed that coccidiosis was probably responsible for the death of the rabbit

The digestibility of the nutrients by the rabbits fed graded level of millet bran is shown in Table 4. The digestibility of the dry matter, crude protein, crude fat, ash and nitrogen-free extract were not significantly different ($p>0.05$); only crude fibre digestibility was significantly better ($p<0.0$) in the groups receiving MB in their diets. The results show that the level of inclusion of millet bran in the treatment diets has a positive effect on the fibre digestibility. This observation compared favourably with the reports of other workers (Igwebuike *et al.*, 1995; Onifade and Tewe, 1993; Uko *et al.*, 2001) who used cereal by-products, such as maize offal, sorghum waste, sorghum bran and millet bran in the diets of growing rabbits. The higher digestibility of fibre in diets 3, 4 and 5 suggests that the fibre in millet bran may be more digestible than that of wheat offal. The increased level of millet bran in the diets is favourable for fibre digestibility in growing rabbits.

CONCLUSION

The result of this study shows that up to 100% millet bran can replace wheat bran without possible adverse effect on the feed intake, feed conversion ratio, weight gain and nutrient digestibility of growing rabbits. It is therefore, recommended that up to 100% wheat bran could be replaced with millet bran in the diets of growing rabbits.

Table 4. Apparent digestibility of nutrients in rabbits fed graded levels of millet bran (MB)

Parameters	Treatment / Diets					
	T_1	T_2	T_3	T_4	T_5	SEM
Dry matter	44.63	63.29	74.34	70.28	63.56	73.66^{NS}
Crude protein (CP)	71.77	82.23	86.04	82.57	86.45	2.95^{NS}
Crude fat	78.94	68.15	82.76	78.88	86.18	4.91^{NS}
Crude fibre	26.45^{c}	17.85^{d}	59.60^{a}	45.36^{b}	67.35^{a}	3.08^{*}
NFE	59.29	61.99	68.73	69.16	72.43	4.77^{NS}

NS = not significant ($p>0.05$); SEM = standard error of mean; NFE = nitrogen-free extract; * = significant ($p<0.05$)

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