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Feeding Value of Mango Leaf (*Mangifera indica*) for Growing Rabbits

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Abstract: A study was carried out to determine the intake and utilization of Mango leaf meal by growing rabbits. Twenty cross weaned rabbits of average weight 700 g were randomly assigned to the five iso-nitrogenous and iso-caloric diets in which wheat offal was substituted at 0, 25, 50, 75 and 100%. The results showed that rabbits weight reduced significantly ($p<0.05$) across the dietary treatments. Weight gain and feed intake were affected significantly ($p<0.05$) by the treatment imposed on the rabbits. Dry matter digestibility, ash and crude fibre digestibility were affected across the treatment. Carcass evaluation values were significantly influenced by the treatment except the kidney. The cost Kg^{-1} diet (^) decreased significantly as the level of dietary inclusion of Mango leaf meal increased from 0 to 100%. At the end of the study the highest savings on feed to produce Kg^{-1} was obtained in the group which consumed 100% mango leaf meal diet. This was closely followed by rabbits on 75, 50 and 25%. It was therefore concluded that Mango leaf meal can be fed to weaner rabbits up to 50% level without any adverse effect on performance variables.

Key words: Mango leaf, growing rabbits, feeding value

INTRODUCTION

The searches for alternative feed sources to improve level of production constitute an important study focus around the globe. Added to this is the high cost and keen competition between man and livestock for conventional feeding stuffs such as grains and seed cakes. Thus rabbit production is not an exception just like chicken has continued to gain considerable interest in recent time. Studies on utilization of crop residue in animal feeds have gained prominence in the past decades because of the clear necessity to conserve grain for human consumption[1]. Tham[2] process cassava leaves to rabbit and Oke[3] found that 15% sundried cassava leaf meal and 30% ensiled cassava leaf meal produced weight gain when fed to rabbit. However, Mambou[4-7] showed that the novel feed stuff such as mango leaves and cocoyam did not have any growth depressing effect on rabbits. The current study investigated the effect of feeding mango leaf as a replacement to wheat offal in the diets of growing rabbits. The study was designed to determined performance, nutrient utilization, carcass evaluation and cost benefit of feeding the test ingredient

MATERIALS AND METHODS

This study was carried out at the rabbitary Unit of Teaching and Research farm, College of Animal Science and Livestock Production, University of Agriculture, Abeokuta, South-West Nigeria.

Mango Leaf Meal (MLM) preparation: Mango leaf meal concentrate was produced using a village-scale method. Matured mango leaves were collected, sun-dried and milled. Thereafter the MLM was used to formulate diet along with other ingredients purchased from reputable feed-mill in south west, Nigeria.

Experimental diets: Five iso-nitrigenous and is-caloric diets were formulated. The first diet was the control containing 35% wheat offal. The wheat offal was substituted at 0,25,50,75 and100%, respectively. The five diets and the MLM were analysed for their proximate constituents

Management of rabbits and experimental layout: A total of 20 cross weaned rabbits were used for the study. The rabbits were housed in hutches which were 0.75 mx0.50 mx1.0 m in size. The back right and left sides of the hutches were fully covered with galvanized sheets while bottom and front doors were made of ½" size wire mesh. Feed and water were supplied ad libitum in a specially designed troughs placed inside each compartment. Completely Randomized Design (CRD) was adopted for the trial with a total of 10 experimenting unit. The rabbits were allowed to acclimatize to the hutches for

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one week before they were fed their respective diets for ten weeks. During these periods daily feed consumption was noted and individual weight change was estimated.

Nutrient utilization trial: At the end of the feeding trial, a digestibility study was carried out. A total of twenty rabbits were randomly selected from the experimenting units, one rabbit from each replicate. The hutches were equipped with facilities that could permit separate collection of faeces. Feed intake and quantity of faeces were recorded daily and later bulked over the whole period of a week per rabbit for dry matter digestibility and chemical analysis.

Carcass and sensory evaluation: Prior to slaughtering, twenty (20) sampled rabbits were denied feed and water for 24 h. They were stunned, bled, dressed by flaying, eviscerated and split. The weight of the cut part and organ were determined.

Also at the end of the feeding trial, rabbits for sensory evaluation were selected randomly, killed and processed. A total of twenty rabbits were used, one from each replicate. The part (Lumber region and hind limb muscle were steamed foe ten minutes. After steaming each parts was cut into small cubes of about 1.5 cm[8]. Rabbits from different treatment were identified with tags. Twenty trained panelist were drawn from the university community including lecturers and students in ratio 1:1. Each member of the panel was located at a sufficient wide distance to avoid any bias and/or discussion. Each judge was provided with clean water and napkins. Score sheets was provided indicating the following parameters; Aroma, taste, texture, juiciness, tenderness and appearance. Each parameter was given a score of 1-7 with 1 being the least score. The judges were instructed to assess the meat and award scores according to their taste.

Cost-benefit analysis: Cost analysis of each diet fed the experimental rabbits was estimated. The cost of dietary ingredient (^/Kg) was noted. Feed intake per rabbit for the period was used to multiply the cost/Kg of feed to obtain the cost of feed consumed by a rabbit for the period. The cost/Kg weight gain was calculated according to the procedure of sonaiya[9].

Chemical and statistical analysis: The chemical composition of MLM was determined according to the method of AOAC[10]. All the data generated from performance indices, nutrient utilization, carcass and sensory evaluation as well as the cost benefit was subjected to ANOVA. Where significant differences were found means were separated. The statistical analysis was performed with the computer using SAS[11] computer software.

RESULTS AND DISCUSSION

Proximate composition of mango leaf meal showed that it contained 89.17% dry matter, 172.4, 189.7, 38.9, 171.4 g Kg^{-1} crude protein, crude fibre, ether extract and ash respectively. A metabolizable energy of 8.75 $MJkg^{-1}$ was also recorded for MLM (Table 1). The proximate composition of MLM reveals that the MLM is superior to wheat of in crude protein, crude fibre and ash content. The high crude fibre might be due to the presence of fibrous carbohydrate like cellulose, hemicelluloses and lignins in the MLM concentrate. It should be noted that the leaves were harvested from matured tree. The slight differences between the crude fibre in the wheat offal and MLM might be attributable to the marginal feed intake observed among the treatment means. Crude fibre had been reported to have negative influence on feed intake.

Aduku[12] observed that the high crude fibre in mango leaves confer a poor acceptability by rabbits. The percentage of ash reported in this study agrees with the earlier report of Jokthan[13] when they fed *Mangifera indica* and *Ficus thonningii* leaves to rabbit. The ash content of the mango leaf might be due to the accumulation of minerals over the years by the mango tree.

The results of performance of rabbits fed MLM diets are presented in Table 2. Final weight of the experimental rabbits reduced ($p<0.05$) across the dietary treatments. Weight gain, daily gain as well as daily feed intake were significantly ($p<0.05$) affected by the dietary treatment. Feed conversion ratios were not affected by the treatment imposed on the rabbits. A significant ($p<0.05$) reduction in the final weight, weight gain and daily weight gain of the rabbits were recorded as the level of MLM in the diet increased. This reduction in the final weight, weight gain and daily weight gain might not be unconnected with the corresponding reduction in the feed intake by the rabbits. The feeding of the MLM diets to the rabbits did not in any way induced mortality as survivability was 100%.

Dry matter digestibility, ash and crude fibre were affected ($p<0.05$) across the treatments. Crude protein digestibility of rabbits fed 0g Kg^{-1} MLM and those fed 25, 50, 75 and 100% MLM were similar. On the other hand a significantly ($p<0.05$) higher values were recorded for ether extract digestibility when rabbits were fed on MLM diets. All the parameters recorded for economics of productions were affected ($p<0.05$) by the treatments. Dry matter digestibility reduced significantly ($p<0.05$) when the rabbits were fed 75 and 100% MLM diet. This is

Table 1: Gross composition of experimental diets and proximate composition of Mango Leaf Meal

Ingredients	1(0%)	2(25%)	3(50%)	4(75%)	5(100%)
Maize	35.00	35.00	35.00	35.00	35.00
Wheat offal	35.00	26.25	17.50	8.75	0.00
Mango leaf meal	0.00	8.75	17.50	26.25	35.00
Groundnut cake	10.00	10.00	10.00	10.00	10.00
Palm kernel cake	10.00	10.00	10.00	10.00	10.00
Soyabean meal	4.00	4.00	4.00	4.00	4.00
Fish meal	1.00	1.00	1.00	1.00	1.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Oyster shell	1.50	1.50	1.50	1.50	1.50
Vitamin premix	0.25	0.25	0.25	0.25	0.25
salt	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated analysis					
Metabolizable energy (MJ kg^{-1})	10.46	10.46	10.80	10.96	11.13
Crude protein	17.88	17.65	17.38	17.13	16.87
Crude fibre	5.67	6.98	8.54	9.61	10.92
Proximate analysis of MLM					
Dry matter	89.17				
Crude protein	17.24				
Crude fibre	18.97				
Ether extract	3.89				
Nitrogen free extract	31.93				
Metabolizable energy (MJ kg^{-1})	8.75				

Table 2: Performance and nutrient utilization of Mango Leaf Meal by growing rabbits

	Replacement level of MLM for wheat offal					
Variables	0	250	500	750	1000	SEM
Performance (g)						
Average Initial weight	700.0	700.0	668.7	675.0	662.05	31.85
Average final weight	1149.7^{a}	1050.0^{ab}	1025.0^{b}	1024.25^{b}	1075.0^{b}	15.91
Average weight gain	449.6^{a}	350.0^{b}	356.2^{b}	349.2^{b}	345.2^{b}	4.56
Daily wight gain	10.7^{a}	8.3^{b}	8.4^{b}	8.3^{b}	8.2^{b}	0.09
Daily feed intake	54.5^{a}	43.1^{b}	40.2^{b}	41.2^{b}	37.6^{c}	0.21
Feed conversion ratio						
	5.1	5.1	4.7	4.9	4.9	0.07
Survivability	100.0	100.0	100.0	100.0	100.0	100.0
Cost-benefit (^)						
Feed cost Kg^{-1}	26.83^{a}	25.91^{b}	24.98^{b}	24.10^{b}	23.15^{c}	0.11
Cost of feed consumed day^{-1}	1.46^{a}	1.12	1.00	0.99	0.87	0.01
Savings on feed to produceKg^{-1}						
weight gain	0.00	1.81	13.30	12.63	22.50	0.10
Apparent nutrient digestibility (%)						
Dry matter digestibility	73.0^{a}	76.6^{a}	78.6^{a}	64.0^{b}	63.0^{b}	10.79
Crude protein digestibility	45.8	46.1	45.2	46.2	46.6	0.49
Crude fibre digestibility	64.8	62.8	66.8	65.9	66.8	1.59
Ether extract digestibility	53.8^{b}	54.9^{b}	56.7^{b}	65.9^{a}	64.7^{a}	5.3
Ash digestibility	71.6	72.8	71.3	71.5	72.6	0.65

^{abc}means on the same row having different super script were significantly different ($p<0.05$)

further pointer to the poor utilization of the MLM diets. Crude protein, crude fibre and ash retention were not affected by the treatment imposed on the rabbits. Ether extract digestibilities were reduced as the level of MLM in the diets increased. This observation is expected since the weights of the experimental rabbits were reduced as a result of the level of MLM inclusion increased.

All the carcass characteristics measured were significantly ($p<0.05$) influenced by the dietary treatments except the kidney weight. The results of the organoleptic study did not show any variation with the treatment imposed on the rabbits. There were no significant ($p>0.05$) differences in the weight of the kidney at the end of the experiment. Since carcass yield is an indication of quality and utilization of the ration Bamgbose and Niba[14], it appears that the rabbits on MLM diets poorly utilized the feed as a result of their significantly ($p<0.05$) lower carcass values. A significantly higher ($p<0.05$) hot carcass weight were obtained when rabbits were fed MLM diet at 50 and 75% compared with when rabbits were fed 25 and 100% MLM diets. This observation could be related to additional bulk and/or greater volume of digester staying in the Gastro Intestinal Tract (GIT) during enzymatic digestion Savory and Gentle[15-18]. Also Thorburn and

Table 3: Carcass and sensory evaluation of rabbits fed mango Leaf Meal based diets

	Levels of MLM					
Variable	0	25	50	75	100	SEM
Carcass (g)						
Live weight	1149.9^{a}	1050.0^{ab}	1025.0^{b}	1024.0^{b}	1007.7^{b}	39.77
Shrunk body weight	1008.72^{a}	900.0^{b}	921.96^{b}	936.0^{b}	901.5^{b}	31.98
Empty carcass weight	808.45^{a}	700.3^{c}	749.7^{b}	752.7^{b}	704.3^{c}	29.82
Hot carcass weight	665.0^{a}	566.5^{c}	609.4^{b}	630.8^{b}	588.3^{c}	25.28
Fore limb	95.8^{a}	75.9^{b}	87.9^{ab}	61.9^{c}	84.2^{ab}	9.52
Hind limb	212.0^{a}	168.7^{b}	200.2^{a}	180.2^{b}	180.4^{b}	10.00
Liver 33.54^{a}	17.55^{c}	27.9^{b}	23.9^{b}	23.8^{b}	2.35	
Kidney	7.84	6.70	5.3	6.6	6.8	0.17
Heart 2.96^{c}	2.84^{b}	3.31^{b}	3.49^{ab}	4.49^{a}	0.29	
GIT 174.1^{c}	183.2^{b}	200.3^{a}	200.3^{a}	200.39^{a}	2.36	
Sensory evaluation						
Aroma	4.7	5.0	6.2	5.1	4.3	0.32
Taste	5.5	5.0	6.7	5.2	4.6	0.30
Juiciness	5.6	5.4	6.3	5.3	4.3	0.30
Texture	4.5	5.1	6.0	5.6	5.5	0.22
Tenderness	4.5	5.3	5.8	5.5	5.2	0.16
Appearance	4.3	5.5	6.0	6.0	5.0	0.15

^{abc} means on the same row having different super script were significantly different ($p<0.05$)

Wilcox[21] opined that structural carbohydrates in diets specifically have mechanical effect on the intestinal wall and cause the GIT to increase and thicken. However, this study reveals that the GIT content reduced ($p<0.05$) when rabbits were fed 50 and 75% MLM diets. The significantly lower value obtained for rabbits fed 25% MLM diet could be probably be due to the physiological activities of the organ as a result of effect of increase MLM diets. There were significant differences among the percentages of the cut parts of rabbits on the various treatments. These results generally indicate that the rabbits fed the MLM diets might have converted the diets more efficiently into lean meat other than fatty meat which has health implication (Table 3).

The cost-benefit Analysis showed that feed cost were significantly ($p<0.05$) reduced as the level of MLM increased in the diets. Saving on feed Kg^{-1} gain were increase as the level of MLM inclusion increased. The results indicate that the replacement of wheat offal with mango leaves will go a long way in reducing the cost of production of rabbit ration especially if lean meat is desirable.

CONCLUSION

Mango leaf meal can replace wheat offal in the diet of rabbits up to 50% without any adverse effect on performance. This is because values of weight gain, feed conversion ratio rabbits at that level were comparable to those on the control. Replacing wheat offal with 35% mango resulted in highest savings on feed cost weight gain Kg^{-1}.

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