Trop. J. Anim. Sci. 3 (1): 119 - 125 (1999)
ISSN: 1119 - 4308

EFFECT OF VARYING LEVELS OF MANGO-SEED KERNEL MEAL ON GROWTH PERFORMANCE, NUTRIENT DIGESTIBILITY AND BLOOD COMPONENTS OF WEANER RABBITS

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Target Audience: Nutritionists, extension agents, farmers, feed manufacturers

ABSTRACT

Twenty-four weaner rabbits were fed *ad libitum* on a diet containing 0, 5, 10 or 15% mango-seed kernel meal (MSKM). The MSKM was used in quantitative replacement of maize offals during the 35-day feeding trial. Rabbits fed 10% MSKM had the highest (P<0.05) growth rate while those on 5 or 15% MSKM - based diets showed superior (P<0.05) growth performance compared to the control diet. Feed conversion ratio were similar (P>0.05) among dietary treatments. Digestibilities of crude protein and carbohydrates significantly decreased (P<0.05) while those of dry matter, crude fibre, ether extract and ash were not significantly (P>0.05) influenced. Dietary MSKM did not significantly (P>0.05) change carcass yield, weights of liver, kidney and heart but the 10% MSKM showed apparent higher values when compared to the 5 or 15% levels. The haematocrit, haemoglobin and leukocytes were also not significantly affected. The findings indicated that MSKM holds potentials for fattening rabbits as a dietary energy source.

Key words: Mango - seed kernel meal, performance, growing rabbits

DESCRIPTION OF PROBLEM

Rabbit production, as a source of meat for alleviating the shortage of animal protein in the diets of people living in the tropics, is gradually expanding. This is because rabbit can utilize efficiently a variety of feed crops to produce meat for human consumption. However, productivity in terms of daily weight and mature body weight gain still falls short of levels already attained in temperate regions. More efficient production through improved nutrition could be achieved by a better understanding of both:

(i) the nutritive value of the locally available ingredients with respect to the rabbit, since comparative animals vary in their digestibility of identical rations (1) as well as

(ii) the exact dietary requirements of different classes of rabbits grown in a tropical environment and fed on locally available ingredients (2).

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The mango fruit, apart from the orange, is the most commonly consumed fruit in Nigeria. Large quantities are transported across state borders while the mango tree itself grows in different soil types especially in the humid tropical zones. The problem with the fruit is that while large quantities are produced every year, only a little quantity in the form of the ripened fruits is utilized either by eating them raw or by small-scale processing into the juice. In either case, the kernel left after removing the pulp is discarded as waste. However, such kernels have been found to be edible to domestic animals that break the mesocarp to remove and eat the seed.

Some efforts have been directed at chemically characterizing the mango-seed kernel meal. The proximate composition was given as 70% carbohydrates, 6% protein and 10% fat (3), in addition to determining the nutrient composition, the feeding value of the mango-seed kernel meal to finishing broiler chickens has been reported (4). There is still paucity of information on the nutritive value of this non-conventional feed resource to rabbits.

This study was therefore designed to investigate the potentials of the mango seed kernel as feed to growing/fattening rabbits.

MATERIALS AND METHODS

The mango-seed kernel meal used in this study was prepared by collecting mango fruits from dumping sites around the Odo-Oba market in the Ogo-Oluwa Local Government area of Oyo State. The pulp was allowed to rot away and the kernels were washed in a moving stream around the University fish pond. The seeds were cut open, the kernels scooped out and sun-dried on a concrete slab. After drying, they were milled in a hammer mill to pass through 1 mm screen and kept in sealed polyethylene bags until required.

Twenty-four rabbits of mixed breed were assigned in a randomized block experiment into four treatment groups with six rabbits per dietary treatment. The diets were formulated to contain, 0, 5, 10 and 15% mango seed kernel meal with the test material replacing maize offal as the energy source. The gross and analysed composition of the diets are shown in Table 1. Rabbits were kept in individual metabolic cages fitted with facilities for feed and water. Weighed quantities of feed were offered to each rabbit daily while water was supplied *ad libitum*.

The experiment lasted thirty-five days during which daily feed consumption was recorded for each rabbit. Weight changes in the test animals were calculated weekly on an individual basis. For diegstibility studies, rabbits were allowed to adjust to the test diets for the first fourteen days and during the 15th to 22nd day of feeding, faecal and urinary outputs of each animal were collected on daily basis. The faecal samples were weighed fresh, then transferred into aluminium cups and oven-dried at 80°C for twenty-four hours. Faecal samples for each animal were bulked for the 7-day collection period. Urinary outputs were measured using a measuring cylinder and aliquots were kept in screw-capped plastic bottles, stabilized by the addtion of 0.1N H_2SO_4

and refrigerated. On the last day of the trial, rabbits were fasted overnight. Blood samples were collected into heparinized tubes through

Table 1. Ingredient and nutrient composition of experimental diets

	Diets			
Ingredients (kg/100kg)	Control	5%	10%	15%
Maize offals	43	38	33	28
Mango seed kernel meal	0	5	10	15
Groundnut cake	18	18	18	18
Palm kernel cake	25	25	25	25
Fish meal	3	3	3	3
Rice husk	1	1	1	1
Bone meal	3	3	3	3
Vitamin / mineral premix*	2	2	2	2
Salt	1	1	1	1
Cotton seed oil	4	4	4	4
Nutrient Composition (g/100gDM)				
Crude protein	20.87	20.39	20.38	20.62
Crude fibre	8.15	7.95	7.87	7.53
Ether extract	12.10	11.98	11.93	11.89
Crude ash	9.90	9.93	9.95	9.98
Nitrogen free extract	48.98	49.75	49.97	49.98

*Vitamin / mineral premix supplied per kg of diets:

Vit. A: 800,000 I.U.; Vit. D 16,000 I.U.; Vit. K 12mg; Vit B_{12} 0.80mg; riboflavin 40mg; pyridoxine 10.4mg; thiamine 10.4mg; D- pantothenic acid 64mg; nicotinic acid 224mg; folic acid 4mg; biotin 0.32mg; copper 56mg; manganese 384mg; zinc 464mg; iron 464mg; selenium 0.96; iodine 0.4mg; cobalt 2.4mg; choline 2230mg; methionine 160mg; BHT 40mg.

jugular venipuncture after which animals were sacrificed by exsanguination. The skin was removed and the carcass cut open to remove the gastro-intestinal tract. Each carcass was weighed to calculate the carcass yield and the liver, heart and kidneys were removed, blotted free of blood and weighed.

Samples of the mango - seed kernel meal, the experimental diets and faeces were analysed for proximate composition (5). Only nitrogen was determined in the urinary samples. The blood samples were analysed by determining the packed cell volume (PVC); haemoglobin (Hb) and white blood cell (WBC) counts.

All the data collected were subjected to Analysis of variance (ANOVA) and differences between means were tested as described (6).

RESULTS AND DISCUSSION

The mango-seed kernel meal was found on analysis to contain 94% dry matter (DM) with crude protein, 6.16%; crude fibre, 4.64%; ether extract, 13.62%; crude ash, 2.23% and nitrogen free extract, 73.35% all on dry matter basis. These values are in agreement with (3, 7, 8). Compared to other non-

conventional feedstuffs, the crude protein content is lower than 12.0% for grape pomace (9); 23.1% for cocoa bean cake (10) and 25% for azolla meal (11). Though the MSKM is lower in protein, ether extract and calculated metabolizable energy compared to maize. It is however higher in ash, fibre and carbohydrate fractions (4).

Growth performance, feed intake and feed conversion ratio for rabbits fed the dietary treatments are shown in Table 2. The 10% level of inclusion of MSKM gave the highest growth (P<0.05) while the 5% and 15% levels also

Table 2. Performance characteristics of rabbits fed diets with varying levels of mango seed kernel meal

Parameter	Control	5%	10%	15%	SD
Weight gain (g/day)	17.66[b]	18.4[b]	19.94[a]	18.33[b]	0.96
Feed intake (g/day)	49.52[a]	51.98[a]	57.29[b]	54.65[ab]	3.36
Protein intake (g/day)	10.83[b]	10.91[b]	12.03[a]	11.48[a]	0.56
Feed Conversion ratio	2.82	2.82	2.90	2.99	0.08

[ab]: means with different superscripts on the same row are significantly (P<0.05) different

showed superior growth performance when compared to the control diet. The significantly (P<0.05) higher final weight recorded on the 10% MSKM diet can be attributed to the higher feed intake by rabbits on this diet. This finding is similar to that reported (12) though their rabbits ate more than we recorded. Daily weight gains in this study were higher than those reported (13) despite the fact that these earlier workers reported higher daily feed intake. The feed conversion ratio of 2.82 - 2.99 obtained in this study are substantially lower than the 4.52 - 5.51 and 4.8 - 6.32 reported earlier (12, 13). This finding suggests that our MSKM containing - diets were superior nutritionally to those of these earlier workers. The superiority of our dietary formulations might be due to the availabiltity of the nutrients in the MSKM.

Nutrients digestibility values (Table 3) decreased signficantly (P<0.05) as the inclusion levels of MSKM increased for CP and NFE. This trend is similar to the findings (9) who fed grape pomace to growing rabbits. This was linked to the tannin content of the grape pomace. Since we do not have information on the tannin content of MSKM, this might necessitate further studies on the levels of anti-nutrients in MSKM. Our results showed that inclusion of MSKM

Table 3. Percentage nutrient digestibility in rabbits fed graded levels of mango seed kernel meal

Treatment	Control	5%	10%	15%	SD
Dry matter	61.56	60.47	57.99	54.88	2.0
Crude Protein	73.44[a]	72.08[a]	68.18[b]	66.53[b]	3.46
Crude fibre	30.73	25.52	28.07	28.23	2.51
Ether extract	89.15	92.17	93.13	89.42	11.16
Crude ash	33.25	42.61	24.88	38.18	7.60
Carbohydrates	64.37[a]	58.89[b]	58.56[b]	54.6[b]	3.35

[ab]: means with diferent superscripts on the sme row are significantly different (P<0.05)

up to 10% level had no significant effect on DM digestibility, which agrees with earlier findings (9).

The carcass yield (Table 4) for all dietary treatments are similar to values reported earlier (14) but are lower than the average of 56.8% for ready-to-cook carcasses of different European rabbit breeds (15).The terminal weights

Table 4. Carcass yield, edible viscera and haematological parameters of rabbits fed varyng levels of mango seed kernel meal

Treatment	Diets				SD
	Control	5%	10%	15%	
Terminal weight (g)	1008.3	1037.5	1099.1	1033.5	38.55
Carcass yield, (%)	51.8	47.82	49.2	49.96	1.84
Liver (PBW)	5.38	6.96	5.55	6.010	0.69
Kidney (PBW)	1.27	1.44	1.54	1.46	0.11
Heart (PBW)	0.59	0.54	0.55	0.51	0.03
(PVC)%	10.66	12.4	12.06	12.27	0.80
Haemoglobin (Hb%)	8.30	7.67	8.1	7.40	0.41
WBC ($10^3/mm^3$)					

PBW: Percentage of body weight.

of all the animals used in the trial suggested that the animals were still growing and since slaughter yield improves with age (15), higher carcass might have been attained if animals were allowed to mature further. The apparently higher value for the 10% MSKM diet compared to rabbits fed the 5 and 15% levels respectively confirm the claim that for a given carcass weight, animals with a higher growth rate and consuming more feed, tend to have a higher carcass yield (15).

Comparatively, the relative weights of the liver and kidney, to body weight recorded in this study are higher than values reported earlier (14). This could be related to the relatively smaller terminal weights of rabbits used in this study.

The PVC, Hb and WBC values for all the dietary treatments were within the range of normal values of 32 - 49% for PVC, 10.1 - 16.6 % for Hb and 5.3 - 11.5 ($x10^3/\mu l$) for WBC (16). While the Hb and PVC values are similar to those of (12), the lower values for animals on the control diet suggest the normocytic iron deficiency anemia speculated by the earlier workers. Since only animals fed the control diet which contained maize offals without MSKM showed this syndrome, then MSKM might contain a factor that can reverse the effect of the iron deficiency anaemia in rabbits

CONCLUSION AND APPLICATIONS

It could be concluded from the results of this study that:

i. mango-seed kernel meal holds potentials for fattening rabbits as an energy source.

ii. there would be the need to popularise the processing of mango fruits to produce the seed kernel among farmers as this would expand their income base and provide an alternative use for mango fruits that would otherwise go waste.

REFERENCES

1. Crampton, E.W. and Harris, L.E. 1969. Applied Animal Nutrition, 2nd edn, W.H. Freeman and Co., San Francisco.
2. Balogun, O.O. 1984. Energy values in the nutrition of rabbits in the humid lowland tropics, 1. The digestible and metabolizable energy values of some Nigerian feedstuffs. World Rev. An. Prod. 20 (3): 39 - 43
3. Samson, J.A. 1986. Tropical Fruits In: Textbook of Tropical Agriculture pp 216.
4. Odunsi, A.A. and Farinu, G.O. 1997. Assessment of Nigerian mango *(Mangifera indica)* seed kernel as a substitute for maize in finishing broiler diets. Ind. J. Ani Sci. 6 (7): 605 - 607.
5. AOAC 1990. Association of Official Analytical Chemists. Official Methods of Analysis 15 edn. Washington DC.
6. Steel, R.G.D. and Torrie, J.H. 1980. Analysis of Variance 1. The one way classification. In Principles and Procedures of Statistics. McGraw-Hill Book Company Inc. New-York.
7. El-Allay, H.A; Anvar, A. and El-Banna, I. 1976. Mango seed kernels as energy sources for chicks. Br. Poul. Sci. 17:129 - 133
8. Das, D.C.; Saliu, B.L; Panda, N.C.; Dehuri, P.K and Mohapatra, H.C. 1988. Mango seed kernel as a feed ingredient in chick ration. Indian Journal of Animal Production and Management 4(2); 92-95.
9. Ferreira, W.M.; Fraga, M.J and Carabano, R. 1996: Inclusion of grape pomace, in substitution for alfalfa hay, in diets for growing rabbits. Anim. Sci. 63: 16 - 174.
10. Odunsi, A.A. and Longe, O.G. 1995. Cocoa bean cake in poultry diets, I. Chemical composition and nutritional value of cocoa bean cake in pullet chick diets. J. Appl. Anim. Res. 7:91-98
11. Nwanna, L.C. and Falaye, A.E. 1997. Substitution of azolla meal for groundnut cake in diets for Nile tilapia *(Oreochronis niloticus).* Appl. Trop. Agric. 2(2): 2 139 - 143.
12. Onifade, A.A and Tewe, O.O. 1993. Alternative tropical energy feed resources in rabbit diets. Growth performance, diet's digestibility and blood composition. World Rabbit Science 1(1): 17 - 24.
13. Joseph, J.K.; Awosanya, B. and Raji, N.O. 1997. The effect of different dietary levels of sweet potato on the performance and carcass quality of rabbits . Appl. Trop. Agric. 2 (2): 120 - 124.
14. Farinu, G.O. 1994. Effect of feeding a compound diet based on non-conventional feedstuffs on growth and carcass characteristics of rabbits. World Rabbit Science 2(4): 123 - 126.

15. **Lebas, F.; Coudert,P.; Rouvier, R. and Rochamboau, H.** 1986. In: The Rabbit: husbandry, health and production. FAO Animal Production and Health Series, No 21 Rome 21 - 48.

16. **Mitruka, B.M. and Rawnsley, H.** 1997. Clinical, Biochemical and Hematological Reference values in Normal Experimental Animals; Masson Publishing USA Inc. N.Y. pp 11 - 174.