THE FEEDING VALUE OF MANGO SEED KERNEL MEAL IN BROILER DIETS

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ABSTRACT

Maize was replaced with Mango seed kernel meal MSKM at 50%, 75%, and 100% levels (w/w) in broiler starter and finisher diets in an eight week feeding trial. 120 day - old broiler chicks were used for the experiment. 30 chicks were randomly assigned to each of the four treatments in a completely randomised design. There were differences ($P < 0.05$) in the average feed intake, average body weight gain and feed conversion efficiency during both phases. Mortality was generally low. However, as MSKM content of the diets increased, performance of the broilers decreased at both phases. At the end of the starter phase, feed intake (g/bird) was 1363, 1239, 1275, 1075 for the diets that contained 0%, 50%, 75 and 100% MSKM respectively. At the finisher phase, consumption was higher in the maize - based diets (0%) and least in 100% MSKM - based diet. Body weight gain (g/bird) was 568, 422, 390 and 240 at the end of starter phase, 1263, 806, 510 and 310 at finishing in that order for the diets that contained MSKM at 0%, 50%, 75% and 100%. Feed cost kg^{-1} and feed cost kg^{-1} live weight gain increased as MSKM in diets increased from 0% to 100% MSKM could be used as an energy source in broiler diets but it needs further processing to fully realise this potential.

Key words: broiler, mango seed kernel meal, energy.

INTRODUCTION

Mango trees (*Mangifera indica*) can be found in several locations in Nigeria in its improved and native forms. The seeds that house the kernels are always discarded as wastes any where the eater finishes eating the juicy mesocarp. However, the establishment

of Mango fruit canning industries would concentrate the seeds and invariably, the kernels at specific locations.

Chemical analysis and metabolizable energy of Mango seed kernel meal determined by EL - Alaily *et al* (1976) and Oresanya (1979) showed that the kernel could be utilized by poultry for energy, even though maize, sorghum and millet are conventional sources of energy. When Job *et al* (1979) replaced maize up to 344.3g maize kg^{-1} with sweet potato in the diets of chicks of Rhode Island Red and Indigenous fowls of Nigeria, they concluded that body weight, food intake, food conversion, nitrogen retention, mortality and relative weights of body parts were not significantly affected at 10 weeks of age. Whitte More *et al*. (1975) also reported that broiler birds fed 40% cooked potato flake grew more slowly than birds on other treatments but their food consumption was the same, that 40% cooked potato flake in diets decreased dry matter of litter and that 20% of cooked potato flake was found to be an acceptable inclusion rate for broiler diets. In the same vein, cassava peel has been fed to cockerels (Ogbonna and Adebawale, 1993) while maize has been replaced with wheat and triticale in broiler diets (Reddy *et al*, 1979). And when Okai and Ahoagye (1990) monitored the effects of mango seed kernel meal (MSKM) on the performance of growing rats, they observed that, MSKM up to 20% in the diet had no adverse effects on growth, feed intake or liver weight.

This experiment was conducted in order to determine the effects of replacing maize with oven dried Mango seed kernel on the performance of broilers.

MATERIALS AND METHODS

Mango seeds collected from various

locations were dehulled and the kernel oven dried milled and later incorporated into diets for broilers. Four dietary treatments used for the study comprised a maize-based diet (0%MSKM) (control) and three mango seed kernel-based diets in which maize was replaced at 50%, 75% and 100% respectively. A total of 120 birds were randomly distributed into the four treatment groups, which were replicated twice. In all there were thirty birds in each treatment group with 10 birds per replicate.

In the 8 weeks feeding trial, the starter diet was formulated to supply 21% crude protein (Table 1) and 2800-2900kcal/kg metabolizable energy (Table 4). The finisher diet contained 19-20 crude protein (Table 2) and approximately 3000kcal kg⁻¹ metabolizable energy (Table 4). Each diet was fed four weeks. Diet formulation was based on the determined proximate analysis (Table 2) but ME of 1.82kcal g⁻¹ determined by El-Alaily *et al* (1976) for MSKM was used.

The birds were reared on deep litter pens which were cleaned and sprayed with sanitized water twice before the arrival of the chicks. Feeding and water troughs were washed in sanitized water and dried before use, even though, water troughs were washed daily afterwards. Wood shavings were used for litter.

During the fourth and seventh weeks respectively two birds from each feeding group were transferred to the metabolic cages where, after 4 - days of adjustment, droppings of the birds were collected for two days from each replicate group. The droppings were bulked and oven dried. The proximate constituents of mango seed kernel meal (MSKM), feeds and

droppings were determined according to the procedure of the (A.O.A.C., (1975).

Weekly body weights and feed consumption were recorded. Analysis of variance was run on the data collected using the procedure outlined by Steel and Torrie (1980) and significant means were separated by the Multiple Range tests procedure of Duncan (1955).

RESULTS.

At both starter and finisher phases of the experiment, there were differences ($P < 0.05$) in the average feed intake, average body weight gain and feed conversion efficiency but there were no significant differences ($P > 0.05$) in mortality (Table 3).

Generally, the performance of the birds decreased but feed cost per kilogram and average feed cost per kilogram live weight gain increased with increase in mango seed kernel meal content of chicks' diets. There were slight significant differences ($P < 0.05$) in the dry matter digestibility, lipid retention and efficiency of energy utilization at both starter and finisher phases but differences were more pronounced for nitrogen retention and dry matter digestibility during finisher phase in group D, that received 100% oven dried MSKM (Table 4). However, lipid retention values were high for all groups.

DISCUSSION

The performance of the chicks (Table 3) could have been influenced by the proportion of Mango seed kernel meal (MSKM) in their diets. This was because lysine was not limiting in their diets as a result of replacing maize with MSKM. In fact, MSKM supplied 4g lysine/16g N (Udayasekhara, 1994) in addition to lysine obtainable from groundnut cake meal which was about 30% of each group diet. Palm oil was used in this feeding trial in order to equalise the energy content of the diets. Similarly, Sharpe *et al.* (1979) used groundnut oil for the same purpose. The quantity of oil used varied increasingly with the increased level of replacement of maize with MSKM because MSKM had lower metabolizable

TABLE 2. PROXIMATE COMPOSITION (%) OF MANGO SEED KERNEL MEAL

Crude protein (N x 6.25)	6.00
Ether extract	6.84
Crude fibre	1.32
Nitrogen free extract	76.64
Ash	3.37
Dry matter	94.17
Gross energy (kcal g ⁻¹)	4.25

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TABLE 1 : COMPOSITION OF THE EXPERIMENTAL STARTER AND FINISHER DIETS (g/100g DM)

Ingredients	Dietary				Treatments			
	Starter diets				Finisher diets			
	A	B	C	D	A	B	C	D
	Control (0% MSKM)	50% MSKM	75% MSKM	100% MSKM	Control 0% MSKM	50% MSKM	75% MSKM	100% MSKM
White Maize	40	20	10	0	40	20	10	0
MSKM	0	20	30	40	0	20	30	40
Groundnut cake	27	30	28	26	27	30	28	26
Fish meal	5	5	7	9	5	5	7	9
Wheat Offals	8.40	4	5	2.99	8.40	5.35	5.80	3.10
Rice Bran	15.90	15.55	13.09	13.40	15.90	15.55	13.09	13.40
Bone meal	2	2	1.31	2	2	2	2	2
Oyster shell	0.36	0.85	0.30	0.30	0.40	0.40	0.40	0.40
Salt (Nacl)	0.30	0.30	0.30	0.30	0.40	0.40	0.40	0.40
Palm oil	0.10	1.30	3.34	5.70	0.90	1.30	3.31	5.70
Methionine	0.50	0.50	0.50	0.50	-	-	-	-
Premix *	0.50	0.50	0.50	0.50	-	-	-	-
Total	100	100	100	100	100	100	100	100

Determined Chemical Composition (% dry matter)								
Dry matter	90.54	91.19	91.21	91.24	92.39	91.20	91.32	92.02
Crude Protein	21.20	21.70	20.80	19.20	20.50	20.60	19.20	18.80
Crude fibre	11.50	11.70	10.80	11.80	12.40	10.60	9.80	11.80
Ether extract	8.44	10.30	9.45	9.32	9.15	8.73	7.66	12.10
Carbohydrates	38.06	34.39	38.56	41.43	41.42	40.07	45.60	48.80
Ash (Total)	10.80	13.10	11.60	9.49	8.92	11.20	9.06	8.52
Gross energy (kcal g ⁻¹)	4.17	4.23	4.23	4.30	4.39	4.21	4.18	4.84

* chick broiler premix provided (per tonne of feed): Vitamin A 15,000,000 iu; D 3,000,000 iu; E 15,000 iu; K1 1,000mg; B1 1,000mg; B6 1000mg; B12 10mg; Biotin 1,000mg; Niacin 30,000mg; pantothenic acid 10,000mg; Folic acid 1,000mg; choline 400,000mg; Vitamin C 10,000mg; Fe 60,000mg; Mn 30,000mg; Mg 0mg; Cu 10,000mg; Zn 70,000mg; Co 500mg; I 200mg; Se 100mg; anti-oxidant 6,000mg. MSKM = Mango Seed Kernel Meal

TABLE 3 : PERFORMANCE OF BROILERS FED THE STARTER AND FINISHER DIETS

Parameters	Dietary		Treatments		S.E
	A	B	C	D	
Feed intake (g/bird)					
Starter	1362.50 ^a	1238.89 ^b	1275.00	1075.00 ^d	43.44
Finisher	5697.50 ^a	3605.56 ^b	3900.00 ^c	3070.00 ^d	86.24
Body weight gain (g/bird)					
Starter	568.33 ^a	422.22 ^b	390.00 ^b	240.00 ^c	15.69
Finisher	1262.50 ^a	805.56 ^b	510.00 ^c	310.00 ^d	25.94
Feed Conversion Efficiency (Feed: Gain)					
Starter	2.40 ^c	2.93 ^b	3.27 ^b	4.48 ^a	0.35
Finisher	4.51 ^b	4.48 ^b	5.23 ^a	5.84 ^a	2.89
Daily Feed intake (g/bird)					
Starter	48.66 ^a	44.25 ^b	45.54 ^{ab}	38.39 ^c	6.21
Finisher	203.48 ^a	128.77 ^b	139.29 ^b	109.65 ^c	12.32
Mortality (%)					
Starter	0	2.50	0	0	0.63
Finisher	0	0	0	0	0
Cost of Production: Feed cost kg ⁻¹ (₦)					
Starter	29.87	29.79	31.75	33.81	
Finisher	18.57	18.46	20.49	22.62	
Feed cost kg ⁻¹ liveweight gain (₦)					
Starter	71.69 ^d	87.28 ^c	103.82 ^b	151.47 ^a	
Finisher	83.75 ^c	82.70 ^c	107.16 ^b	132.10 ^a	

abcd: Mean differently superscripted were significantly different ($P < 0.05$)

TABLE 4 NUTRIENT UTILIZATION BY BROILERS FED MANGO SEED KERNEL MEAL

Parameters	Dietary		Treatments		SE
	A	B	C	D	
Dry matter digestibility (%)					
Starter	83.29 ^c	91.10 ^a	89.54 ^b	82.89 ^c	1.67
Finisher	79.68 ^b	80.76 ^b	89.30 ^a	39.26 ^c	11.21
Nitrogen retention (%)					
Starter	84.06 ^b	91.04 ^a	89.90 ^{ab}	87.58 ^b	1.48
Finisher	79.69 ^b	81.05 ^b	90.56 ^a	34.40 ^c	12.58
Lipid retention (%)					
Starter	93.86 ^a	90.22 ^b	84.92 ^c	88.42 ^b	1.86
Finisher	95.99 ^a	95.42 ^a	97.18 ^a	88.98 ^b	1.84
Metabolizable energy (kcal g ⁻¹ (calculated))					
Starter	2.83	2.87	2.91	2.94	0.024
Finisher	2.98	2.90	2.96	3.62	0.12
M.E/GE x 100(%)					
Starter	78.87 ^a	67.85 ^b	68.79 ^b	54.42 ^c	3.45
Finisher	67.88	68.88	70.81	70.66	0.71

abcd: means differently superscripted were significantly different ($P < 0.05$)

energy (ME) of 1.82kcal g⁻¹ compared with maize whose ME was 3.4kcal g⁻¹ (EL Alaily *et al.*, 1976). Significant differences ($P < 0.05$)

observed in the feed intake (Table 3) as the MSKM content of diets increased could be due to the possibility that MSKM was

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unpalatable (EL-Alaily *et al*, 1976) and this caused feed intake to be depressed. The unpalatable nature of MSKM must have been responsible for feed wastage through spillage by the birds. By this habit (feed wastage) a large quantity of feed would be needed by the birds for each unit of weight gain. This opinion agreed with the report of Alaily *et al* (1976). The effect of including high proportions of oven-dried MSKM in broiler diets became more pronounced when birds were almost (75% MSKM) or totally (100% MSKM) made to obtain energy from MSKM in their diets as maize was replaced with MSKM.

Low mortality observed in the experiment (Table 3) pointed to the fact that the suspected toxic factor was not lethal, and if it were, its concentration might not have been high enough to kill the birds. It was possible that the high heat to which MSKM was subjected to during oven-drying at the bakery could have tempered (reduced) its potency to kill or cause a large proportion of it to evaporate from the surface of the kernels.

The utilization of nutrients in MSKM might have been negatively influenced due to the possibility of the presence of toxic factors in MSKM (Annison, 1971) which he supposed interfered with the uptake of the nutrients, in MSKM and possibly nutrients in the entire diet(s). However, Opeke (1992) reported that the mango kernels contained tannins, hence, these tannins alone or in addition to other unidentified toxic factor(s) might have been responsible for the variations observed in the performance and nutrient utilization of the broilers.

High DM and nutrient digestibilities observed at both phases of the experiment pre-supposed that diets and nutrients could be digested and absorbed but not utilized hence, reduced performance of the birds as MSKM content of diets increased. Similarly, Calhoun *et al* (1960) and Ford *et al* (1967) reported that absorption of a nutrient did not necessarily imply that the nutrient was utilized. However, the reduced growth observed among the groups could imply that protein metabolism was

adversely affected by MSKM in their diets.

It could, therefore, be concluded that MSKM could serve as a source of energy in broiler diets and it could replace a fairly high proportion of maize in their diets but it could be necessary to process it beyond oven-drying in order to realize its full potential in feeding poultry.

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