

PERFORMANCE AND ECONOMICS OF BROILER CHICKENS FED DIETS CONTAINING GRADED LEVELS OF PROCESSED MANGO SEED KERNEL

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ABSTRACT

This study evaluated the effects of incorporating graded levels of processed mango seed kernel (MSK) into broiler diets as a partial replacement for maize performance and economics of production. Processing methods such as fermentation and toasting were employed to reduce anti-nutritional factors inherent in raw MSK. Six experimental diets were formulated for both starter phase (23%CP) and finisher phases (20%CP) using two processing methods i.e. toasted mango seed kernel meal (TMSKM) and fermented mango seed kernel meal (FMSKM) at three different levels of inclusion i.e., 0%, 10% and 20% with the following diets combinations (0%, TMSKM), (10%, TMSKM), (20%, TMSKM), (0%, FMSKM), (10%, FMSKM) and (20%, FMSKM) tagged as diets 1, 2, 3, 4, 5 and 6 respectively. One hundred and eighty (180) day old broiler chicks were used for the experiment. The birds were randomly allotted to six (6) dietary groups of thirty (30) birds per treatment in a completely randomized design (CRD) and the birds were fed experimental diets and water ad libitum. Feed consumption from each treatment was measured on daily basis by subtracting left over from feed served per group. The mean daily feed intake was calculated on daily basis by dividing the amount consumed by the number of birds in the group. The body weight change of each of the treatment group was obtained by calculating the difference between the mean live weights of the current week from the mean live weight of the preceding week. Results from DFI and DWG revealed that the treatment group were similar at both starter, finisher and overall performance phase. While the FCR were significantly ($p < 0.05$) affected. However, the inclusion of processed MSK up to 20% in broiler diets did not adversely affect feed intake, weight gain, or feed conversion ratio. Conclusively, birds fed diets with 20% fermented MSK exhibited comparable growth performance to those on conventional maize-based diets. Economically, the use of processed MSK reduced feed costs per kilogram of weight gain, indicating its potential as a cost-effective feed ingredient.

Keywords: Broiler, Mango Seed Kernel, Performance, Economics

1.0 INTRODUCTION

Broiler production in Nigeria has seen significant growth and development in recent years, driven by increasing demand for poultry meat as a source of protein and income (Siregaret *et al.*, 2020). Poultry meat particularly broiler meat, is a popular and affordable source of protein for the Nigerian population, making broiler production a key sector of the country's agricultural economy. According to a study by (Olomuet *et al.*, 2020), the broiler production industry in Nigeria has experienced steady growth due to factors such as favorable government policies, increasing consumer demand, and improved production technologies. On the other hand, the high cost and

volatility of conventional feed ingredients, particularly maize, have prompted renewed interest in alternative energy sources in poultry nutrition (Akinola *et al.*, 2022). Mango seed kernel (MSK), an agro-industrial by-product of mango pulp processing, is increasingly recognized for its potential in poultry feeding due to its moderate energy and fat content (Ogundipe *et al.*, 2021). However, raw MSK contains anti-nutritional factors such as tannins, phytates, and cyanogenic glycosides, which limit its direct use in poultry diets (Ibrahim *et al.*, 2020).

Processing methods like fermentation and heat treatment have been shown to reduce these anti-nutrients and improve MSK's digestibility and nutrient availability (Chinedu *et al.*, 2022). For instance, fermentation significantly improves protein content and reduces cyanogenic content, making it safer and more effective for broiler consumption (Bako *et al.*, 2023). Toasting, on the other hand, has been found to denature heat-sensitive anti-nutrients and improve fat digestibility in poultry (Adeyemo *et al.*, 2020). Several studies have demonstrated that partial replacement of maize with processed MSK up to 20% in broiler diets does not significantly affect growth performance or feed efficiency (Nworgu *et al.*, 2021). Additionally, broilers fed fermented MSK showed comparable weight gain and feed conversion ratios with those on conventional maize-based diets (Mohammed *et al.*, 2022). Economic analysis also indicates that using MSK in broiler diets can substantially reduce feed cost per kilogram of live weight gain (Yakubu *et al.*, 2023). Despite the promise, responses to MSK inclusion may vary depending on the level of inclusion, processing method, and age of birds (Idris *et al.*, 2024). Other studies caution against inclusion above 20% due to potential reductions in feed intake and nutrient digestibility (Okonkwo *et al.*, 2023). Nevertheless, the incorporation of processed MSK remains a viable strategy in reducing feed cost and promoting sustainable poultry production, particularly in regions where mango processing waste is readily available (Abubakar *et al.*, 2021). With High cost of conventional feed resources such as maize due to high competition with man and on the other hand, low level of maize production due to drought and other effect of climatic change in Nigeria which is attributed also to the high cost of maize for poultry feeding, there is great need to look for alternatives that can replace the high demands for such ingredients. The current study therefore evaluate the effects of incorporating graded levels of processed mango seed kernel meal (fermented and toasted) as a partial replacement for maize on the performance and economic efficiency of broiler chickens.

2.0 MATERIALS AND METHODS

2.1 Study Area

The study was conducted at the Poultry Unit of the Teaching and Research Farm, Federal University of Kashere, Gombe State, Nigeria. Kashere town is situated about 70 kilometers from Gombe town. It lies between latitude 9° 4' N and longitude 10° 57' E, and altitude of 349m above sea level. The average rainfall ranges from 800mm to 900mm per annum. The dry season last for seven months, between October to May, and raining season from May to September. The annual temperature ranges from 32-38°C and experiences relative humidity of 17-90%.

2.2 Experimental Birds and Management

A total of one hundred and eighty (180) day-old broiler chicken ZARTECH (Cobb 500) was used for the experiment. All management practices geared towards successful operation were dully carried out. The day old chicks were housed in a brooder pen within brooding guards for a period of one week brooding period after which they were moved into the experimental unit. The chicks were raised in a standard deep litter system. The poultry house and the necessary equipment were cleaned, fumigated and disinfected using 10% formalin, potassium permanganate and Dettol

before the arrival of the birds. The birds upon arrival were given vitalyte and glucose to revive them from stress after the long journey. Vaccination against Newcastle and Gumboro was carried out accordingly. The routine operations carried out under the growing phase were the daily cleaning; sweeping and washing of the experimental pen floor with IZAL and the daily administration of feeds and daily feed intake measurement, provision of clean water and the weekly weighing.

2.3 Collection and Processing of Mango Seed

Mango seeds were collected from various dumping sites of major markets within Kumo Town. It was cut and open manually, mango kernel was removed from each half of the seed. The removed kernels were divided into 2 parts for further processing. The First portion of the mango seed kernel was soaked in water at room temperature and allowed for fermentation for two days (48 hours) after which it was rinsed thoroughly with water and sun dried for 7 days, to form fermented mango seed kernel meal (FMSKM). The second part was toasted for 30 minutes at 100°C, and milled to form toasted mango seed kernel meal (TMSKM).

2.4 Experimental Diets

Six experimental diets were formulated for both starter phase (23%CP) and finisher phase (20%CP) using two processing methods i.e. fermented mango seed kernel meal (FMSM) and toasted mango seed kernel meal at three different levels of inclusion i.e., 0%, 10% and 20% with the following treatment diets combinations (0, FMSKM), (10, FMSKM), (20%, FMSKM), (0, TMSKM), (10, TMSKM) and (20%, TMSKM) to be tagged as diets 1, 2, 3, 4, 5 and 6 respectively. The broiler birds were fed experimental diet *ad libitum* and water supplied without restriction. Table 2 and 3 showed the experimental diets fed to broiler birds at starter and finisher phases respectively.

2.5 Experimental Design

One hundred and eighty (180) unsexed broiler chicks were used for the experiment, whereby 30 birds per treatment were randomly allotted to six treatment diets that were replicated 3 times of 10 birds per replicate in a completely randomized design (CRD). The experiment lasted for seven weeks.

2.5.1 Growth Performance

A weighed quantity of feed was served to the birds per replicate on daily basis and the left over feed was collected, weighed and recorded. Thus, the total feed intake of each group was determined by the difference between the feed served and the left over feed. Such that the total feed intake= total feed served – left over feed. The average daily feed intake was determined by dividing the total feed intake with the number of days that the experiment lasted.

Mathematically, Average daily feed intake = Total feed intake/ Duration of feeding trial.

2.5.2 Daily weight gain

Prior to the commencement of the experiment the initial body weight of each bird was collected and recorded. Subsequently the birds were weighed on weekly basis. At the end of the experiment, the body weight gain of the birds was determined by subtracting the initial body weight from the final body weight. Then the average daily body weight gain of the birds was determined by dividing their body weight gain with the number of days the experiment lasted.

Mathematically; Body weight gain = final body weight – initial body weight

Average daily body weight gain = total body weight gain divided by the number of days of experiment.

2.5.3 Feed Conversion Ratio (FCR)

Feed conversion ratio was calculated by dividing the average daily feed intake with the average daily weight gain

Feed conversion ratio (FCR) = Feed intake/Body weight gain

2.6 Data analysis

All data collected were subjected to analysis of variance using Statistical Package for Social Science (SPSS, 2000) and where significance differences among treatment exist, Duncan Multiple Range Test (DMRT) was used to separate them (Duncan, 1955).

Table 1: Proximate Composition of Mango Seed Kernel

Parameters	Toasted	Fermented
Dry matter (%)	7.2	11.03
Crude protein (%)	8.4	11.04
Ash content (%)	2.62	2.1
Ether extract (%)	14.6	11.35
Crude fibre (%)	2.9	2.4
NFE	64.27	62.06

Table 2: Percentage composition of the experimental dies to be fed to broiler chicken at the starter phase (1- 4 Weeks)

Ingredients	Diets					
	1	2	3	4	5	6
Maize	41.33	37.19	33.06	41.33	37.19	33.06
FMSM	0.00	4.13	8.26	-	-	-
TMSM	-	-	-	0.00	4.13	8.26
Soya bean(FF)	40.97	40.97	40.97	40.97	40.97	40.97
Wheat bran	10.00	10.00	10.00	10.00	10.00	10.00
Fish meal	4.00	4.00	4.00	4.00	4.00	4.00
Bone meal	3.00	3.00	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25	0.25	0.25
+Premix	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00	100.00

Calculated						
Analysis						
C. P. (%)	23.18	23.35	23.56	23.18	23.35	23.56
C. F. (%)	3.96	3.98	4.00	3.96	3.98	4.00
Calcium (%)	5.60	6.05	6.52	5.60	6.05	6.52
Phosphoru (%)	0.97	1.47	2.12	0.97	1.47	2.12
Methionine(%)	0.39	0.41	0.43	0.39	0.41	0.43
Lysine (%)	1.38	1.47	1.59	1.38	1.47	1.59
M.E (Kcal./kg)	3071.86	3059.98	3048.45	3071.86	3059.98	3048.45

* ME (Kcal./kg) = $37 \times \%CP + 81.8 \times \%CF + 35.5 \times \%NFE$, Pautenga, *et al.*, 1985;

C. P. = Crude Protein, C. F. = Crude Fibre

Table 3: Percentage composition of the experimental dies to be fed to broiler chicken at the starter phase (5- 8 Weeks)

Ingredients	Diets					
	1	2	3	4	5	6
Maize	46.26	41.63	37.00	46.26	41.63	37.00
FMSM	0.00	4.62	9.25	-	-	-
TMSM	-	-	-	0.00	4.62	9.25
Soya bean (FF)	33.04	33.04	33.04	33.04	33.04	33.04
Wheat bran	15.00	15.00	15.00	15.00	15.00	15.00
Fish meal	2.00	2.00	2.00	2.00	2.00	2.00
Bone meal	3.00	3.00	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25	0.25	0.25
+Premix	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10	0.10
Total	100.0	100.00	100.00	100.00	100.00	100.00

Calculated						
Analysis						
C. protein (%)	20.23	20.27	20.31	20.23	20.27	20.31
C. Fibre (%)	4.05	4.04	3.91	4.05	4.04	3.91
Calcium (%)	5.94	5.45	5.04	5.94	5.45	5.04
Phosphor (%)	0.78	1.81	2.26	0.78	1.81	2.26
Methionine(%)	0.33	0.36	0.51	0.33	0.36	0.51
Lysine (%)	1.12	1.25	2.18	1.12	1.25	2.18
ME (Kcal./kg)	3015.66	3002.42	2989.51	3015.66	3002.42	2989.51

*ME (Kcal./kg) = $37 \times \%CP + 81.8 \times \%CF + 35.5 \times \%NFE$, Pautenga, *et al.*, 1985

Table 4: Proximate Composition of Experimental Diets (Starter Phase.)

Parameters	T1	T2	T3	T4	T5	T6
Dry matter (%)	92.54	92.6	92.7	92.54	92.94	91.27
CrudeProtein (%)	22.98	22.25	22.36	22.98	22.18	21.55
Ash content (%)	7.29	7.46	6.76	7.29	7.56	6.85
Ether Extract (%)	3.14	3.41	3.81	3.14	3.15	3.25
Crude fibre (%)	8.43	8.24	8.43	8.43	8.65	8.33
ME (Kcal/kg)	3076.2	3067.1	3057.2	3076.2	3060.7	3088.01
Ca	1.25	1.2	1.22	1.25	1.27	1.2

T1 (0%TMSKM), T2 (10%TMSKM), T3 (20%TMSKM), T4 (0%FMSKM), T5 (10%TMSKM), T6 (20%TMSKM)

Table 5: Proximate Composition of Experimental Diets Finisher Phase

Parameters	T1	T2	T3	T4	T5	T6
Dry matter (%)	91.92	91.12	91.88	91.92	91.87	92
CrudeProtein (%)	20.54	20.29	20.26	20.54	20.23	19.98
Ash content (%)	6.19	6.32	6.65	6.19	6.76	6.81
Ether Extract (%)	3.11	3.28	3.4	3.11	3.22	3.21
Crude fibre (%)	9.27	9.37	9.45	9.27	9.31	9.33
ME (Kcal/kg)	3223	3218.4	3203.4	3223	3213	3223
Ca	1.1	1.06	1.0	1.1	1.03	1.1

T1 (0%TMSKM), T2 (10%TMSKM), T3 (20%TMSKM), T4 (0%FMSKM), T5 (10%TMSKM), T6 (20%TMSKM)

3.0 RESULTS AND DISCUSSIONS

3.1 Growth performance of broiler chicken fed diet containing graded level of fermented and toasted mango kernel seed meal during starter phase (1-4 weeks)

The performance of broiler chicken during starter phase (1-4 weeks) as affected by level (0, 10, 20%) and processing (fermented and toasted) mango kernel seed meal is presented in Table. 6 In the starter phase, Daily feed intake, Daily weight gain and Feed conversion ratio were not significantly ($P>0.05$) affected by both dietary levels and processing methods mango kernel seed meal. The value for daily feed intake range from 525 to 535.83g in levels and 516.11 to 540.56g for processing methods and the values were statistically similar ($P>0.05$). the daily weight gain range from 32.89 to 33.11g in levels and 24.53 to 25.74g for the processing methods and the values showed no significant difference between the values ($P>0.05$). The feed conversion ratio followed the same trend and from 1.29 to 1.32 in levels and 1.29 to 1.34g in processing methods.

Table: 6 Main effects of level of inclusion and processing methods on growth performance at starter phase (1-4weeks)

Parameters	level of inclusion			SEM	LOC	1	2	p value	LOS
	0%	10%	20%						
TWG	535.83	525.00	524.17	0.77	NS	540.56	516.11	0.12	NS
TFI	685.47	690.63	691.00	0.77	NS	694.26	690.48	0.55	NS
DWG	25.51	24.93	24.97	0.76	NS	25.74	24.53	0.11	NS
DFI	33.17	32.89	32.98	0.77	NS	33.06	32.87	0.54	NS
FCR	1.30	1.33	1.33	0.79	NS	1.29	1.34	0.17	NS

a,b = Means on the same row with different superscripts differ significantly (P<0.05).

SEM = Standard error of the Means. LOS = Level of Significance. 1 = Toasted 2 = Fermented

3.1.1 Interaction effects of level of inclusion and processing method on growth performance at the starter phase (1-4weeks).

The performance of broiler chicken during starter phase (1-4 weeks) as affected by interaction level (0, 10, and 20%) by processing (fermented and toasted) mango kernel seed meal is presented in Table. 7 In the starter phase, Daily feed intake, Daily weight gain and Feed conversion ratio were not significantly (P>0.05) affected by both dietary levels (0, 10, and 20%) by processing methods (fermented and toasted) mango kernel seed meal. The value for daily feed intake ranged from 33.11g to 32.85g for toasted while fermented ranges 32.59 to 33.12g and the values were statistically similar (P>0.05). the daily weight gain ranged from 24.95g to 26.76g in toasted and 23.17g to 25.47g as in fermented and the values were not significantly difference between the values (P>0.05). The feed conversion ratio followed the same trend and varied between to 1.25g to 1.30g in toasted and 1.30g to 1.41g in fermented.

Table: 7 interaction effects of level and processing method on growth performance starter phase (1-4weeks)

Parameters	Toasted			Fermented			SEM	LOS
	0%	10%	20%	0%	10%	20%		
total weight gain	536.67	523.33	561.67	535	526.67	486.67	0.08	NS
total feed intake	695.33	689.93	697.5	695.6	691.33	684.5	0.57	NS
daily weight gain	25.55	24.95	26.76	25.47	24.93	23.17	0.1	NS
daily feed intake	33.11	32.85	33.21	33.12	32.92	32.59	0.58	NS
feed conversion ratio	1.3	1.32	1.25	1.3	1.32	1.41	0.18	NS

a,b = Means on the same row with different superscripts differ significantly (P<0.05).

SEM = Standard error of the Means. LOS = Level of Significance

The daily feed intake (DFI) values obtained this study ranged from 32.88 to 33.11 to g. These values were in comparable to the values 31 to 40g reported by Diarraet *al.* (2010) who fed broiler chicks diets containing 0 to 20 % mango seed kernel meal but higher than the findings of Abdullahi *et al.* (2017) who reported DFI of 49.75 to 51.55 g in broiler chicks fed diets containing 0 to 20 % mango seed kernel meal. This difference may be attributed to the differences in the variety of mango used in the two studies. The daily weight gain (DWG) ranged between 24.94 and 25.51g.

These values were lower than 2 g obtained by Abdullahi *et al.* (2017) in broiler chickens fed varying levels of mango cake. The probable reason for this difference could be the method of processing and the strain of broilers used. The feed conversion ratio (FCR) obtained in this study ranged from 1.29 to 1.32. The FCR values are similar with those reported by Diarra *et al.* (2010) who fed broiler chicks diets containing mango seed kernel meal who reported the values of 1.89 to 1.97 in broiler chickens fed varying levels of mango seed kernel meal.

3.1.2 Main effects of level and processing method Growth performance of broiler chicken finisher phase (5-8 weeks)

The performance of broiler chicken during finisher phase (5-8 weeks) as affected by fermented and toasted mango kernel seed meal is presented in Table.8 In the finisher phase, Daily feed intake, Daily weight gain were significant ($P>0.05$) and Feed conversion ratio were significantly ($P>0.05$) affected by both dietary levels. While processing methods of fermented and toasted mango kernel seed meal. Daily feed intake and total weight gained were not significant ($P>0.05$). The feed conversion ratio is highly significant ($P>0.001$).

Table: 8 Main effects of level and processing methods Performance of Broiler Chickens Finisher phase

Parameters	level of inclusion			SEM	LOS	processing methods			
	0%	10%	20%			1	2	SEM	LOS
total weight gain	2857.33 ^a	2823.60 ^{ab}	2769.25 ^b	0.0236	*	2818.44	2815.01	0.88	NS
Daily weightgain	136.068 ^a	134.53 ^{ab}	131.87 ^b	0.0246	*	134.22	134.094	0.91	NS
Daily feed intake	136.07 ^a	134.53 ^{ab}	131.87 ^b	0.0235	*	134.09	134.21	0.91	NS
total feed intake	2857.33	2823.6	2769.33	0.0227	*	2815.00	2818.4	0.90	NS
feed conversion ratio	1.95833 ^a	2.16833 ^b	2.10667 ^b	0.0055	**	2.17778 ^b	1.97778 ^a	0.0006	***

a,b,c = Means on the same row with different superscripts differ significantly ($P<0.05$).

SEM = Standard error of the Means. LOS = Level of Significance. 1 = Toasted 2 = Fermented

3.1.3 Main effects of level and processing method Growth performance of broiler chicken finisher phase (5-8weeks)

Table: 9 show the main effect of level and processing method on the growth and performance of broiler chickens. The result revealed that level of inclusion did not affect daily feed intake, daily weight gain and total weight except total feed intake ($P>0.05$) and feed conversion ratio ($P>0.01$) with the best values on the control diet (0%MSM). The parameters observed on both processing methods (Toasting and Fermentation) were similar except feed conversion ratio with best value of 1.80 obtained in broiler chicken fed fermented mango seed kernel meal diets.

Table: 9 Interaction effects of level and processing method Growth performance of broiler chicken during finisher phase (5-8weeks)

Parameters	Toasted			Fermented			SEM	LOS
	0%	10%	20%	0%	10%	20%		
Total weight gain	2846.83	2822.83	2785.67	2867.83	2824.37	2752.83	0.62	NS
Daily weight gain	135.58	134.42	132.65	136.56	134.64	131.08	0.63	NS
Total feed intake	2846.8	2822.8	2785.7	2867.8	2824.4	2752.8	0.65	NS
Daily feed intake	135.58	134.42	132.65	136.56	134.64	131.08	0.65	NS
Feed conversion ratio	2.27 ^b	2.07 ^b	2.19 ^b	1.64 ^a	2.26 ^c	2.03 ^a	0.0001	**

^{a,b} = Means on the same row with different superscripts differ significantly (P<0.05).

SEM = Standard error of the Means. LOS = Level of Significance

3.1.4 Main effects of level and processing methods performance of broiler chicken at the overall phase (1-8 weeks)

The Pooled performance of broiler chicken (1-7 weeks) as interaction (level and processing) mango kernel seed meal is presented in Table. 10 In the finisher phase, Daily feed intake and Daily weight gain were not significantly (P>0.05) affected by both dietary levels and processing methods of fermented and toasted mango kernel seed meal. While feed conversion ratio is highly significant (P>0.01).

Table: 10 Main effects of level and processing methods performance of broiler chicken at the overall phase (1-8 weeks)

Parameters	level of inclusion			SEM	LOC	processing methods		SEM	LOS
	0%	10%	20%			1	2		
Total feed intake	3560.30 ^a	3514.23 ^{ab}	3460.25 ^b	0.0202	*	3512.7	3510.49	0.9301	NS
Daily feed intake	85	1453	82	0.3964	NS	996.4	83.6	0.337	NS
daily weight gain	48.70	43.53	43.82	0.3883	NS	46.81	43.9	0.344	NS
tota weigh gain	2045.8	1828.3	1840.8	0.334	NS	1966.1	1843.9	0.443	NS
feed conversion ratio	1.76 ^a	1.92 ^b	1.88 ^b	0.0007	**	1.90 ^b	1.80 ^a	0.0022	**

^{a,b,c} = Means on the same row with different superscripts differ significantly (P<0.05).

SEM = Standard error of the Means. LOS = Level of Significance. 1 = Toasted 2 = Fermented

3.1.5 Interaction effects of level and processing methods performance of broiler chicken at the overall phase (1-8 weeks)

The Pooled performance of broiler chicken (1-7 weeks) as interaction(level by processing) mango kernel seed meal is presented in Table: 11 In the finisher phase, Daily feed intake and Daily weight gain were not significantly (P>0.05) affected by both dietary levels and processing methods of fermented and toasted mango kernel seed meal. While feed conversion ratio is highly significant (P>0.01)

Table: 11 Interaction effects of level and processing methods performance of broiler chicken at the overall phase (1-8 weeks)

Parameters	Toasted			Fermented			SEM	LOS
	0	10	20	0	10	20		
Total feed intake	3542.17	3512.77	3483.17	3578.43	3515.70	3437.33	0.4199	NS
Daily feed intake	84.33	82.98	82.93	85.2	83.7	81.84	0.3965	NS
daily weight gain	43.09	44.84	43.76	54.32	42.22	43.88	0.335	NS
tota weigh gain	1810	1883.3	1838.3	2281.7	1773.3	1843.3	0.3667	NS
feed conversion ratio	1.95 ^b	1.86 ^c	1.90 ^b	1.57 ^a	1.98 ^b	1.86 ^b	0.0001	***

^{a,b,c} = Means on the same row with different superscripts differ significantly (P<0.05). SEM = Standard error of the Means. LOS = Level of Significance.

The DFI values obtained in this study ranged from 131.08 to 136.56 g. The values obtained were lower to the values of 95.61 to 101.89 g reported by Babawuro and Muhammad (2018) who fed broiler chickens with diets containing groundnut cake and full fat soya bean but comparable with the findings of Saulawaet *al.* (2018) who reported DFI values between 126.44 and 135.38 g in the broiler chickens fed diets containing differently processed baobab seed meal.

The values of FCR obtained in this study ranged between 1.6 and 2.27. These values agreed with 1.13 to 2.9 reported by Gbawuan, (2011) for broiler chickens fed diets containing mango kernel seed meal but contrary with the findings of Lakurbeet *al.* (2018) who reported values of 3.13 to 4.18 and Babawuro and Muhammad (2018) who reported values of 3.17 to 3.53. 4.3

3.2 Feed Bio Economics of broiler chicken Fed Graded Levels of mango Seed kernel Meals.

The feed cost in ₦ per kg (₦ 431.05 – ₦476.01) decreased with an increase in the inclusion level of MSKM in the diets. The cost in ₦ per kg body weight gain also decreased with increasing level of MSKM. The feed cost in naira per kilogram body weight gain was lowest in diet 3(20% TMSKM) and the cheapest at the starter phase. Abanget *al.*,(2016) who reported poor feed conversion ratio and increasing feed cost per kilogram body weight gain of broiler chickens fed raw and boiled pigeon pea seed meal. On economic grounds, feeding TMSKM beyond 20 % is not cost effective.

Table: 12 Feed Bio Economics of broiler chicken fed processed mango seed kernel based diets at the starter phase

Parameters	Diets					
	1	2	3	4	5	6
TFI(kg)	0.69	0.69	0.7	0.7	0.69	0.68
FC(₦/kg)	680.02	660.02	640.19	680.02	658.37	633.89
TFC (₦)	469.21	455.53	448.13	476.01	454.28	431.89
TWG(kg)	0.54	0.52	0.56	0.54	0.53	0.49
FC(₦/kg)	869.91	876.02	800.23	881.5	857.13	879.69

3.2.1 Feed Bio Economics of broiler chicken Fed Graded Levels of mango Seed kernel Meals.

The feed cost in ₦ per kg (₦ 590.29 – ₦638.46) decreased with an increase in the inclusion level of MSKM in the diets. The cost in ₦ per kg body weight gain also decreased with increasing level of MSKM. The feed cost in naira per kilogram body weight gain was lowest in diet 4(0% FMSKM) and the cheapest at the finisher phase. Yisaet *al.* (2012) who reported poor feed conversion ratio and increasing feed cost per kilogram body weight gain of broiler chickens fed raw and boiled pigeon pea seed meal. On economic grounds, feeding TMSKM beyond 20 % is not cost effective.

Table:13 Feed Bio Economics of broiler chicken fed processed mango seed kernel based diets at finisher phase

Parameters	Diets					
	1	2	3	4	5	6
TFI(kg)	2.85	2.82	2.78	2.87	2.82	2.75
FC(₦/kg)	638.46	616.25	593.99	638.46	614.38	590.29
TFC (₦)	1819.61	1737.82	1651.29	1832.38	1732.55	1623.29
TWG(kg)	1.25	1.36	1.28	1.7	1.25	1.36
FC(₦/kg)	1455.69	1277.81	1290.07	1078.46	1386.04	1193.6

3.2.2 Feed Bio Economics of broiler chicken Fed Graded Levels of mango Seed kernel Meals.

The feed cost in ₦ per kg (₦ 612.09 – ₦659.24) decreased with an increase in the inclusion level of MSKM in the diets. The cost in ₦ per kg body weight gain also decreased with increasing level of MSKM. The feed cost in naira per kilogram body weight gain was lowest in diet 4(0% FMSKM) and the cheapest at the finisher phase. Yisaet *al.* (2012) who reported poor feed conversion ratio and increasing feed cost per kilogram body weight gain of broiler chickens fed raw and boiled pigeon pea seed meal. On economic grounds, feeding TMSKM beyond 20 % is not cost effective.

Table 14 Feed Bio Economics of broiler chicken fed processed mango seed kernel based diets overall phase

Parameters	Diets					
	1	2	3	4	5	6
TFI (kg)	3.54	3.51	3.48	3.58	3.52	3.44

FC(₦/kg)	659.24	638.14	617.09	659.24	636.38	612.09
TFC (₦)	2307.34	2239.87	2147.47	2360.08	2240.06	2105.59
TWG(kg)	1.81	1.88	1.83	2.23	1.77	1.84
FC(₦/kg)	1274.59	1191.42	1173.48	1035.12	1265.57	1144.34

The feed cost in N per kg (N 612.09 – N659.24) decreased with an increase in the inclusion level of MSKM in the diets. The cost in N per kg body weight gain also decreased with increasing level of MSKM. The feed cost in naira per kilogram body weight gain was lowest in diet 4(0% FMSKM) and the cheapest at the finisher phase. Yisaet *al.* (2012) who reported poor feed conversion ratio and increasing feed cost per kilogram body weight gain of broiler chickens fed raw and boiled pigeon pea seed meal. On economic grounds, feeding TMSKM beyond 20 % is not cost effective.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

The findings suggest that processed mango seed kernel can be included in broiler diets at levels up to 20% without compromising growth performance or feed efficiency. Processing methods effectively mitigate anti-nutritional factors, enhancing the nutritional value of MSK. The economic analysis indicates that incorporating processed MSK can reduce feed costs, contributing to more sustainable and cost-effective broiler production.

4.2 Recommendations

1. Incorporate processed MSK at levels up to 20% in broiler diets to achieve cost savings without negatively impacting performance.
2. Employ effective processing techniques such as fermentation and toasting to reduce anti-nutritional factors in MSK, enhancing its suitability as a feed ingredient.
3. Conduct long-term studies to assess the effects of processed MSK on carcass quality and overall bird health to validate its efficacy further.
4. Perform comprehensive cost-benefit analyses in different production settings to determine the economic viability of using processed MSK in broiler diets.

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