Performance of broiler finisher chickens fed varied levels of mango seed kernel meal as replacement for maize

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Abstract

The performance of broiler finisher chickens fed varied levels of mango seed kernel meal as replacement for maize was studied. Mango seed kernel was fed as replacement for maize at 0, 20, 40, 60, 80 and 100% for treatments 1-6, respectively. 20% mango seed kernel showed the best result in feed intake, average daily weight gain, feed to gain ratio and feed cost per kilogram weight gain. This performance declined with increasing replacement levels of MSK. Thus, in the study, it is concluded that mango seed kernel can replace maize at 20% in the diet of broiler chickens without negatively affecting performance. Higher inclusion levels beyond 20% resulted in declined feed intake and productive parameters.

Keywords: broiler, performance, mango seed kernel, maize

Introduction

Feed accounts for 70-80% of the total cost of production in the livestock industry (Kehinde *et al.*, 2006). Cereal grains such as maize have remained the major energy source in poultry diets (Idachaba, 2012). As climate is fast changing, the production of maize cannot keep pace with its demand for food and industrial uses (Kurtong, 2014). This necessitates the use of non-conventional feed ingredients as they offer the best alternative to over dependence on conventional feed sources (Dafwang *et al.*, 2001). Mango seed kernel (MSK) contains carbohydrate (69.2 - 80%), protein (7.5 - 13%), fibre (2.0 - 4.6%), ash (2.2 - 2.6%), calcium (0.21%) and phosphorus (0.22%), which is comparable to maize, depending on the variety (Diarra *et al.*, 2010). Despite the nutritive value of mango seed kernel, there are limitations to its use in monogastric nutrition. Fowomola (2010) reported that mango seed kernel contains anti-nutritional factors ANFs such as tannin, saponin, phytate, oxalate and cyanide. These anti-nutrients impair

digestion and utilization of feed in livestock animals especially poultry birds. However, processing MSK by soaking has shown significant reduction in ANFs in mango seed kernel with consequent improvement in its utilization (Idris, 2012). Rocha *et al.* (2007); Fowomola (2010); Dakare *et al.* (2012) and Idris (2012) studied the effect of several processing methods on anti-nutritional factors in mango seed kernel. Their reports showed that animal nutritionists can bridge the gap in animal protein intake if more attention is paid to processing and utilization of mango seed kernel. This informed the decision to evaluate the performance and carcass characteristics of broiler finisher chickens fed varied levels of mango seed kernel meal as replacement for maize.

Materials and methods

Collection and processing of mango seed kernel

Mango seed kernel was collected from Zaria, Sabon Gari, Soba and Giwa Local Government Area of Kaduna State. The

collection was done during the months of April and May which represents the peak of mango production in Zaria. The seed kernel was processed by removing the seed coat with the aid of a knife after which it was crushed into pebbles (small particle sizes). About 100g of crushed MSK per litre of water was soaked for 72 hours. The water was drained and another replaced at regular intervals of 8 hours for 3 days. The soaked MSK was shade dried, milled and analysed for proximate compositions and anti-nutritional factors according to the AOAC (1994) procedure.

Source of experimental birds

Arbor acre breed of chickens were purchased from Nu-BREED farms located in Ibadan, south western Nigeria.

Preparation of experimental diets

Six experimental diets were formulated to meet their nutrient requirement according to recommendations of NRC (1994). The processed mango seed kernel was incorporated in the diets to replace maize at levels of 0, 20, 40, 60, 80 and 100% designated as T₁, T₂, T₃, T₄, T₅ and T₆ respectively (Table 1).

Table 1: Feed composition of experimental broiler finisher diet

Ingredients	0%	20%	Mango seed 40%	kernel 60%	80%	100%
Maize	57.61	45.63	33.64	21.66	9.66	0.00
Groundnut cake	21.39	21.85	22.32	22.77	23.25	21.39
Mango seed kernel	0.00	11.52	23.04	34.57	46.09	57.61
Soybean (full fat)	10.00	10.00	10.00	10.00	10.00	10.00
Fish meal	3.00	3.00	3.00	3.00	3.00	3.00
Wheat offal	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
Limestone	0.50	0.50	0.50	0.50	0.50	0.50
Common salt	0.30	0.30	0.30	0.30	0.30	0.30
Lysine	0.20	0.20	0.20	0.20	0.20	0.20
Methionine	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin premix	0.25	0.25	0.25	0.25	0.25	0.25
TOTAL	100	100	100	100	100	100
Calculated analysis						
ME Kcal/kg	3013	2972	2864	2864	2864	2864
Crude protein (%)	21.0	21.00	21.00	21.00	21.00	21.00
Crude fibre (%)	3.30	3.40	3.40	3.50	3.70	3.60
Ether extract (%)	6.50	6.50	6.50	6.70	6.90	6.50
Available p. (%)	0.61	0.61	0.61	0.61	0.61	0.61
Lysine (%)	1.12	1.10	1.10	1.10	1.10	1.10
Methionine (%)	0.6	0.55	0.53	0.55	0.55	0.55
Cost/kg diet (₦)	79.82	76.61	75.58	74.62	73.85	71.65

Biomix chick premix provide per kg of diet vit A, 10,000 i.u; vit D3, 2000 i.u; vit. E 23mg; vit K, 2.mg; calcium pantothenate, 7.5mg; B12, 0.015mg; folic acid, 0.75mg; choline chloride, 300mg; vit B1, 1.8mg; vit B2, 5mg; vit B6, 3mg; manganese, 40mg; iron, 20mg; zinc, 53.34mg; copper, 3mg; iodine, 1mg; cobalt, 0.2mg; selenium, 0.2mg; zinc, 30mg

Experimental design and management of birds

Two hundred and seventy (270) broiler finisher chickens were used for the study. They chickens were weighed and randomly

assigned to six treatment groups, each replicated three times with 15 chickens per replicate. The chickens were reared on a deep litter with feed and water provided *ad libitum*. Parameters measured were initial

weight, final weight, feed intake, feed conversion ratio, feed cost per kilogram gain and mortality as it occurred.

Carcass evaluation

At the end of the feeding trial, three chickens were selected from each replicate based on the group mean weight and processed for carcass evaluation. The selected chickens were fasted overnight and thereafter bled by severing the jugular vein. This was followed by scalding in hot water feather removal. Their live weights were taken after which they were bled. Dressing percentage was calculated, while weights of the breast, thigh, wing, back, heart, kidney, liver, gizzard, head, neck, shank, and viscera were measured and expressed as percentages of the live weight.

Statistical analysis

Data obtained were subjected to analysis of variance, using the general linear model procedure of SAS (2001). Significant treatment means were separated using Duncan's Multiple Range Test according to procedures described by Steel and Torrie (1980).

Results and discussion

Performance of broiler finisher chickens fed varied levels of mango seed kernel meal as replacement for maize

Performance of broiler finisher chickens fed varied levels of mango seed kernel meal as replacement for maize is presented in Table 2. Average daily weight gain significantly ($P < 0.05$) decreased with increasing replacement levels of MSK. Birds in T_1 and T_2 showed the best average daily weight gain compared to other treatments. This decline in average daily weight gain with increasing levels of MSK may be attributed to the astringent taste of MSK in the diets of the birds. This is consistent with the report of Rocha *et al.* (2007) who asserted that MSK at high

inclusion levels can affect broiler performance.

Results of feed intake also reflected that of average daily weight gain as it also declined with increasing levels of MSK. This was attributed to the possibility of residual effect of anti-nutrients in the seed kernel even after it was processed by soaking. This corroborates the assertion of Dauda (2006) who observed that oil seeds processed by soaking may contain some residual ANFs which may affect utilization at high inclusion levels. Dakare *et al.* (2012) also reported similar observation that tally with the present study. Okolie and Ugochukwu (1989) studied the effect of soaking duration on hydrogen cyanide of some legume seeds. Their reports showed drastic reduction in anti-nutrients, however residual effects were reported.

Other productive parameters of feed to gain ratio and feed cost per kilogram weight gain decreased with increasing levels of mango seed kernel. This is similar to the report of Tegua (1995). In all parameters studied, 20% replacement of maize with mango seed kernel showed the best result. Higher replacement levels beyond 20% MSK interfered with intake, weight gain, feed to gain ratio and feed cost per kilogram weight gain.

Effect of varied levels of mango seed kernel based diets on carcass characteristics of broiler finisher chickens

The live weight, dressed weight, dressing percentage, thigh and breast weight were significantly ($P < 0.05$) affected by varied levels of mango seed kernel (Table 3). These parameters declined with increasing levels of mango seed kernel in the diet of the birds. Birds fed 0 and 20% inclusion of mango seed kernel showed the best results while 80 and 100% inclusion levels showed the poorest result in all parameters studied. The best values observed in carcass

Performance of broiler chickens fed mango seed kernel based diets

characteristics for birds fed 20% inclusion level of mango seed kernel was attributed to better feed utilization at that level. Higher levels of mango seed kernel beyond 20% inclusion negatively affected carcass characteristics probably due to residual effect of anti-nutrients at higher inclusion levels.

Fetuga *et al.* (1975) reported that carcass quality is closely related to dietary nutrient quality. Internal organs such as heart,

kidney, intestine, lungs and gizzard significantly ($P < 0.05$) increased with increasing levels of mango seed kernel in the diet of the birds. Dauda (2006) reported that oil seeds processed by soaking may contain some residual anti-nutrients which may affect utilization at high inclusion levels. Birds fed 20% inclusion level of mango seed kernel showed normal weights of internal organs compared higher levels of mango seed kernel which increased organ weights.

Table 2: Performance of broiler finisher chickens fed varied levels of mango seed kernel meal as replacement for maize

	Replacement for maize						
Parameters	0%	Mango seed	kernel				
		20%	40%	60%	80%	100%	SEM
Initial weight (g/b)	420.00	420.00	420.00	420.00	420.00	420.00	0.00
Final weight (g/b)	1500.00 ^a	1400.00 ^a	1133.33 ^b	1033.33 ^{bc}	866.6 ^c	766.67 ^c	49.06
Weight gain (g/b/d)	7.29 ^a	5.08 ^{ab}	3.71 ^b	3.10 ^b	3.05 ^b	2.91 ^b	0.73
Feed intake (g/b/d)	14.16 ^{ab}	14.48 ^a	14.51 ^a	14.14 ^{ab}	13.48 ^b	13.91 ^{ab}	0.12
FCR	2.14 ^a	2.89 ^b	3.96 ^c	4.58 ^d	3.05 ^b	4.79 ^d	0.20
Feed cost/kg gain(₦)	177.06 ^b	172.19 ^b	237.18 ^a	264.52 ^a	236.04 ^a	237.68 ^a	11.10
Mortality (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

a,b,c= Means with different superscript on the same row differ significantly ($P < 0.05$), SEM= Standard error of means, FCR= Feed Conversion Ratio, g/b/d= gram/bird/day

Table 3: Effect of graded levels of mango seed kernel based diets on carcass characteristics of broiler finisher chickens

Parameters	0%	20%	Mango seed 40%	kernel 60%	80%	100%	SEM
Live wt (g)	1500.00 ^a	1400.00 ^a	1133.33 ^b	1033.33 ^b	866.67 ^c	766.67 ^c	49.06
Slaughter wt	1333.33 ^a	1300.00 ^a	1033.33 ^b	900.00 ^{bc}	566.67 ^{cd}	700.00 ^d	52.70
Dressed wt (g)	1233.33 ^a	1200.00 ^a	966.67 ^b	800.00 ^{bc}	666.67 ^{cd}	600.00 ^d	57.73
Dressing%	58.01 ^{ab}	64.5 ^a	53.03 ^b	54.85 ^b	50.83 ^c	50.38 ^c	1.69
Thigh (%)	11.12 ^a	12.86 ^a	10.99 ^b	9.80 ^{bc}	9.95 ^{bc}	9.15 ^c	0.14
Breast (%)	14.04 ^a	14.11 ^a	11.99 ^b	11.84 ^b	10.12 ^c	10.22 ^c	0.26
Back (%)	12.91	14.64	13.82	12.43	13.41	12.73	0.67
Head %	3.22 ^c	3.75 ^b	4.07 ^{ab}	3.67 ^{bc}	4.04 ^{ab}	4.36 ^a	0.15
Neck (%)	6.60	6.30	6.62	5.54	5.46	5.32	0.50
Wing (%)	8.48	8.83	8.70	8.57	9.74	9.46	0.49
Liver (%)	2.97	2.96	3.14	3.51	3.22	3.50	0.32
Spleen%	0.18	0.16	0.15	0.17	0.22	0.17	0.03
Heart (%)	0.56 ^b	0.68 ^{ab}	0.60 ^{ab}	0.70 ^{ab}	0.61 ^{ab}	0.84 ^a	0.08
Kidney (%)	0.55	0.71	0.81	0.72	0.91	0.89	0.09
Lungs (%)	0.53 ^c	0.54 ^c	0.63 ^b	0.75 ^b	1.12 ^a	0.99 ^a	0.13
Gizzard full (%)	4.33 ^c	4.41 ^c	4.23 ^b	5.68 ^{ab}	6.05 ^{ab}	6.36 ^a	0.29
Gizzard empty %	2.62	2.68	3.15	2.78	3.01	2.99	0.25
Intestine lgt (cm)	250.67	230.00	238.67	233.00	243.33	243.33	12.89
Intestine full%	6.41 ^c	8.56 ^c	11.24 ^{ab}	10.58 ^b	12.01 ^{ab}	13.09 ^a	0.71
Intestine empty%	3.45 ^b	3.81 ^b	6.16 ^{ab}	6.02 ^{ab}	6.82 ^a	6.85 ^a	0.83
Abdominal fat%	1.80	1.78	0.80	1.26	1.56	0.97	0.30
Shank (%)	5.21 ^b	6.36 ^a	5.76 ^{ab}	5.51 ^{ab}	5.51 ^{ab}	5.36 ^{ab}	0.32

abcd = Means with different superscripts in the same row are significantly different ($P < 0.05$) SEM = standard error of the mean

Conclusion

The study showed that mango seed kernel when processed by soaking can effectively replace maize at 20% level without compromising performance and carcass characteristics.

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