HAEMATOLOGICAL AND CARCASS CHARACTERISTICS OF BROILER CHICKENS FED DIFFERENTLY PROCESSED MANGO SEED KERNEL MEAL

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ABSTRACT

An experiment was conducted to evaluate the haematological and carcass of differently processed mango seed kernel meal (MSKM) on broiler chickens for eight weeks. The processing includes: soaking for 24 and 72hours, boiling and soaking and boiling. Two hundred and twenty-five (225) day old broiler chicks were randomly allotted to five dietary treatments with three replicates of 15 birds each in completely randomized design. The experimental diets consisted of raw, soaked for 24hours, soaked for 72hours, boiled and soaked and boiled mango seed kernel meal included at 10% in both broiler starter and finisher diets designated as T1, T2, T3, T4 and T5. The proximate composition, carcass and haematology of broiler chickens were obtained. T3 has the highest crude protein (8.37%) compared to T1 (6.03%) and the crude fibre ranges from 1.99-2.82% for T4 and T2 respectively. The carcass analysis shows that there was significant difference in dressing %, liver and abdominal fat across the treatments. Haematological evaluation shows that all the parameters were significant. From the experiment conducted, it is therefore concluded that mango seed kernel based diets does not affect the carcass characteristics of broiler chickens

Keywords: Mango seed kernel meal, Soaking, Carcass, Haematology, broiler chickens

Introduction

Poultry production is gaining popularity in the developing countries due to its role in bridging the protein malnutrition, economic empowerment of the resource poor segment of the society and its ability to fit well in the farming systems commonly practiced (Gebremedhn and Alemu, 2015). Such growth in the poultry industry is having a profound effect on the demand for feed and raw materials. However, it is also becoming clear that the requirements for the four traditional feed ingredients (maize, soybean meal, fish meal and meat meal) cannot be met (Adewale *et al.,* 2016). The gap between local supply and demand for these traditional ingredients are expected to be widening over the coming decades thus, providing a compelling reason for exploring the usefulness of locally available alternative feedstuffs in feed formulation (Adewale *et al.,* 2016). Substituting maize with another non-conventional energy sources such as cassava peels (Ojebiyi *et al*., 2014), mango seed kernel meal (Diarra, 2014) etc, had been discovered to be of great importance. This research is aimed at evaluating the effect of feeding diets containing differently processed mango seed kernel on the carcass and haematology of broiler chickens

Materials and Methods

Experimental Site:

The experiment was conducted at the Poultry Unit of Bauchi State College of Agriculture Bauchi Teaching and Research farm. Bauchi State occupies a total land area of 49,119 km² representing about 5.3% of Nigeria's total land mass and is located between latitudes 9° 3' and 12° 3' North and longitudes 8° 50' and 11° East (BSD, 2009).

Experimental Design and Management of Birds

A total of two hundred and twenty-five (225) broiler chicks were used for the experiment. They were randomly divided into five treatment groups of 45 chicks per group in a completely randomized design (CRD) consisting of three replicates of 15 birds each. Birds were reared on a deep litter, with feed and water provided *ad libitum*. Routine vaccines were given as recommended.

Collection and Processing of Mango seed into Mango Seed Kernel Meal

Mango Seed Kernel were collected from various locations in Sibire, Ardo kola LGA of Taraba State. The kernels were obtained by cutting the seed coat using a knife or crushed with a

hammer. The Mango Seed Kernel (MSK) obtained were divided into five parts. The parts processed either by soaking for 24 and 72 hours, boiling and soaking for 24 hours and boiled.

Soaking of mango seed kernel for 24 hours

The Mango Seed Kernel were soaked in water for 24 hours at the rate of 100g per 1.5 litre of water in containers. The water was changed at regular intervals of 8 hours. The Mango Seed Kernels were then removed and sundried. The dried MSK were then milled before incorporation into the diets.

Soaking of mango seed kernel for 72 hours

The Mango Seed Kernel were soaked in water for 72 hours at the rate of 100g per 1.5 litre half of water in containers. There was change of water at regular intervals of 8 hours for 3 days. The Mango Seed Kernels were then removed and sundried. The dried MSK were then milled before incorporation into the diets.

Boiling of mango seeds kernel

The Mango Seeds Kernel were put in boiling water at the rate of 100g per 1.5 litre of water at 100^{o}C temperature for 30 minutes. The sample were removed, drained, sun dried, and milled before incorporation into the diets.

Soaking for 24 hours and boiling of mango seeds kernel

The Mango Seed Kernel were soaked in water for 24 hours at the rate of 100g per 1.5 litre of water in containers. The Mango Seeds Kernel was put in boiling water at the rate of 100g per litre and half of water at 100^{o}C temperature for 30 minutes. The sample was removed, drained, sun dried, and milled before incorporation into the diets.

Experimental Diets

Five broiler starter and finisher diets were formulated. Diet 1 was the control 10% raw MSKM, diet 2, 3,4 and 5 contained soaked for 24 hours, soaked for 72 hours, soaked for 24 hours and boiled and boiled MSKM respectively all at 10% level of inclusion as replacement for maize.

Determination of the proximate composition of mango seed kernel

The proximate composition (Table 3) was obtained by analyzing the different samples of mango seeds kernel according to the methods described by AOAC(1990).

Results and Discussions

Proximate composition of mango seed kernel Meal

The Mango seed kernel meal with a protein content of 6.03-8.37% is higher than 4.7% CP of mango fruit reported by Palma Castillo and Hurtado (2009) and similar than 6-10% reported by Diarra (2014). The raw mango seed kernel content 6.03% CP, 2.47% CF, 5.52% EE and 1.67% Ash which is lower than 8.75% CP, 3.01% CF, 14.82% EE and 3.24% Ash reported by Diarra and Usman (2008); Diarra and Usman (2008) also reported composition of boiled mango seed kernel meal to contain 7.81%CP, 2.94%CF, 15.97%EE and 2.21% Ash which is higher than 6.38% CP, 1.99% CF, 5.47% EE and 1.07% Ash. The decrease in crude protein values as a result of boiling is in line with the observation of reported by Akinmutimi and Onwukwe (2002). This has been attributed to the leaching of nutrients due to boiling. Ether extract of 5.52%, fibre 2.47% and ash 1.67% were all below the reported values of 5.3%, 14.6% and 7.7%, respectively (Palma Castillo and Hurtado, 2009). Naveen *et al*. (2007) reported the proximate of mango fruit pulp alone as 4.2% CP, 6.9% crude fibre, and 2.4% EE. Kansci *et al*., (2008) reported that mango fruit composition varies greatly. It may therefore be normal to have differences among different reports. It is also likely that the factors making the mango fruits to be rejected by humans such as bruises, infections, premature ripping and or premature fallen from the tree etc. contribute in reducing the protein content as compared to some reports above which were not necessarily of rejected mango fruits but rather by-products. It could also be due to varietal differences (Orayaga *et al.,* 2015).

Carcass Characteristic of Broiler Chicken Fed MSKM

The values of dressing percentage of 58.86-67.90% were similar to 60.82-65.22% earlier reported by Joseph and Abolaji (1997) also similar to 62.70-65.20% as reported by Diarra *et al.,* 2011 who fed similar diets to broiler bird. The abdominal fat (0.74-2.53%) was similar to 1.82-1.95% reported by Diarra *et al.,* (2011). The spleen, kidney and liver were also not affected by dietary treatment. Bawa *et al*. (2003) reported that the effects of feeding processed legume grain on organ yield were observed to be the best means of testing processing methods. The result was an indication that soaked and boiled mango seed had no effects on carcass characteristics of the birds and the nutrients were well utilized.

Haematological Indices of Broiler Finisher Fed Differently Processed Mango Seed Kernel Meal

The haematological indices are the reflection of the effect of dietary treatments on the birds. PCV was significantly higher ($p < 0.05$) in treatment 4 birds (boiled mango seed kernel meal), though all the values across the five diets were within the normal range (21 to 45%) reported by Amao and Siyanbola (2013). All the RBC mean values across the treatments falls within the normal range (1.58 to 3.82) reported for broilers by Amao and Siyanbola (2013). This means bird placed on differently processed mango kernel were not anemic nor show sign of polycythemia. The haemoglobin concentration ranged from 5.80-9.13g/dl was similar to 9.58-962g/dl as reported by Diarra and Usman (2008). All the haematological parameters analyzed were comparable to values reported in literature as normal for chickens (Awoniyi *et al*., 2000; Faniyi, 2002).

Conclusion and Recommendation

Mango seed kernel based diets does not affect the carcass characteristics of broiler chickens. Proper assembling and storage of mango seed kernel which will make it more readily available should be encouraged.

Table 1: Composition of Broiler Starter Diets (1-4 weeks)

	Treatments				
Ingredients	**Control Raw**	**Soaked for 24 hours**	**Soaked for 72 hours**	**Boiled**	**Soaked and boiled**
	T1	**T2**	**T3**	**T4**	**T5**
Maize	38.86	38.86	38.86	38.86	38.86
Full-fat Soya bean	34.44	34.44	34.44	34.44	34.44
MSKM	10.00	10.00	10.00	10.00	10.00
Fish meal	3.00	3.00	3.00	3.00	3.00
Wheat Offal	10.00	10.00	10.00	10.00	10.00
Bone meal	2.50	2.50	2.50	2.50	2.50
Limestone	0.50	0.50	0.50	0.50	0.50
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
T OTAL	**100**	**100**	**100**	**100**	**100**
Calculated analysis					
ME (Kcal/Kg)	2,967.86	2,917.	2,917.67	2,917.67	2,917.67
Crude Protein %	23.00	23.00	23.00	23.00	23.00
Crude fibre %	4.60	4.60	4.60	4.60	4.60
Ether Extract %	3.84	3.84	3.84	3.84	3.84
Calcium %	1.39	1.39	1.39	1.39	1.39
Phosphorus %	0.89	0.89	0.89	0.89	0.89
Lysine %	1.66	1.66	1.66	1.66	1.66
Methionine %	0.54	0.54	0.54	0.54	0.54

* Premix: Composition of vitamin per kg is as follows: Vitamin A, 8000iu; Vitamin D31600iu; Vitamin E5iu; Vitamin K 0.200mg; Vitamins B, thaimine B. 0.5mg; Riboflavin B2 4mg; Pyridoxine B6 0.015mg; Niacin 0.015mg; B12 0.01mg; Pantothenic acid 0.5mg; folic acid 0.5mg and Biofin 0.020mg; chlorine chloride 0.02mg; Anti-oxidant 0.125g and Minerals (Mn, Zn, Fe, Cu, I, Si Co) 0.056g.

MSKM- Mango Seed Kernel meal

ME- Metabolizable Energy

Table 2: Composition of Broiler finisher diets (5-8 weeks)

Ingredients	Treatments				
	Control Raw	Soaked for 24 hours	Soaked for 72 hours	Boiled	Soaked and boiled
	T1	T2	T3	T4	T5
Maize	46.79	46.79	46.79	46.79	46.79
Full-fat Soya bean	26.01	26.01	26.01	26.01	26.01
MSKM	10.00	10.00	10.00	10.00	10.00
Fish meal	3.00	3.00	3.00	3.00	3.00
Wheat Offal	10.00	10.00	10.00	10.00	10.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Limestone	0.50	0.50	0.50	0.50	0.50
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
T OTAL	**100**	**100**	**100**	**100**	**100**
Calculated analysis					
ME (Kcal/Kg)	2978.32	2,978.32	2,978.32	2,978.32	2,978.32
Crude Protein %	20.00	20.00	20.00	20.00	20.00
Crude fibre %	4.29	4.29	4.29	4.29	4.29
Ether Extract %	3.92	3.92	3.92	3.92	3.92
Calcium %	1.54	1.54	1.54	1.54	1.54
Phosphorus %	0.93	0.93	0.93	0.93	0.93
Lysine %	1.43	1.43	1.43	1.43	1.43
Methionine %	0.40	0.40	0.40	0.40	0.40

* Premix: Composition of vitamin per kg is as follows: Vitamin A, 8000iu; Vitamin D31600iu; Vitamin E5iu; Vitamin K 0.200mg; Vitamins B, thaimine B. 0.5mg; Riboflavin B2 4mg; Pyridoxine B6 0.015mg; Niacin 0.015mg; B12 0.01mg; Pantothenic acid 0.5mg; folic acid 0.5mg and Biofin 0.020mg; chlorine chloride 0.02mg; Anti-oxidant 0.125g and Minerals (Mn, Zn, Fe, Cu, I, Si Co) 0.056g.
MSKM- Mango Seed Kernel meal
ME- Metabolizable Energy

Table 3: Proximate Composition of Differently Processed Mango Seed Kernel

Nutrients	Treatments				
	Control Raw	Soaked for 24 hours	Soaked for 72 hours	Boiled	Soaked and boiled
	T1	T2	T3	T4	T5
Crude protein	6.03	7.40	8.37	6.38	6.17
Crude fibre	2.47	2.82	2.17	1.99	2.48
Ether extract	5.52	5.45	5.46	5.47	5.24
Ash	1.67	2.19	1.11	1.07	1.57
Moisture	5.79	6.52	7.01	6.16	6.63

Table 4: Carcass Traits (percentage body weight) of Broiler Chickens Fed Differently Processed Mango Seed Kernel Meal

	Treatments					
Parameters	**Control Raw**	**Soaked for 24 hours**	**Soaked for 72 hours**	**Boiled**	**Soaked and boiled**	
	T1	**T2**	**T3**	**T4**	**T5**	**SEM**
Live weight (g)	1466.67	1433.33	1650.00	1250.00	1566.67	82.54NS
Pluck weight (g)	1430.67	1396.67	1489.67	1174.33	1507.33	202.33NS
Carcass weight (g)	992.67	947.00	1010.33	726.00	1011.33	150.89NS
Eviscerated weight (g)	1099.67	1038.00	1127.33	811.33	1115.33	140.70NS
Dressing %	67.75^{a}	67.90^{a}	60.42^{ab}	58.68^{b}	64.57^{ab}	3.57*
Heart (%)	0.47	0.49	0.54	0.45	0.53	0.09NS
Lungs (%)	0.69	0.72	0.73	0.65	0.58	0.09NS
Head (%)	2.88	2.61	2.71	2.84	2.66	0.26NS
Legs (%)	4.35	3.77	4.53	4.31	3.93	0.40NS
Spleen (%)	0.16	0.12	0.10	0.10	0.15	0.05NS
Gizzard (%)	2.87	2.96	3.02	2.77	3.14	0.20NS
Large intestinal length (cm)	9.67	9.00	8.67	8.67	9.00	1.03NS
Small intestinal length (cm)	230.00	225.33	214.00	207.00	211.33	10.44NS
Liver (%)	3.41^{a}	3.41^{a}	2.89^{ab}	2.46^{b}	2.65^{ab}	0.37*
Pancreas (%)	0.26	0.38	0.31	0.27	0.32	0.06NS
Caeca length (cm)	17.00	14.67	16.33	15.00	18.00	2.80NS
Kidney (%)	0.73	0.86	0.76	0.78	0.73	0.10NS
Abdominal fat (%)	2.53^{a}	2.18^{a}	0.74^{b}	1.82^{a}	1.82^{a}	0.35 *

^{a,b}: means within the same row bearing different superscripts are significantly different (P<0.05)
NS: Not Significant
SEM: Standard Error of Mean

Table 5: Haematological Indices of Broiler Finisher Fed Differently Processed Mango Seed Kernel Meal

	Treatments					
Parameters	**Control Raw**	**Soaked for 24 hours**	**Soaked for 72 hours**	**Boiled**	**Soaked and boiled**	**SEM**
	T1	**T2**	**T3**	**T4**	**T5**	
Packed cell volume (%)	25.23^{c}	25.10^{c}	26.17^{b}	28.83^{a}	19.33^{d}	0.37*
Haemoglobin (g/dl)	8.13^{b}	7.33^{c}	8.43^{b}	9.13^{a}	5.80^{d}	0.20*
Red blood cell ($\times10^{9}$/l)	1.83^{b}	1.96^{ab}	1.85^{b}	2.07^{a}	1.88^{b}	0.06*
White blood cell ($\times10^{9}$/l)	218.43^{b}	229.10^{a}	214.60^{b}	227.40^{a}	187.83^{c}	2.63*
Mean corpuscular volume (FL)	137.67^{b}	128.13^{c}	142.23^{a}	135.23^{b}	140.93^{a}	1.36*
Mean corpuscular haemoglobin concentration (g/dl)	32.13^{a}	29.07^{c}	32.13^{a}	31.60^{ab}	30.13^{bc}	0.80*
Mean corpuscular haemoglobin (Pg)	44.33^{a}	37.70^{b}	45.17^{a}	42.67^{a}	42.3^{a}	2.04*
Platelet (($\times10^{9}$/l)	9.00^{b}	1.33^{c}	15.33^{a}	2.33^{c}	7.00^{b}	1.03*
Neutrophil (%)	4.47^{b}	4.23^{ab}	3.63^{b}	4.33^{ab}	5.10^{a}	0.39*
Lymphocyte (%)	96.37^{abc}	95.57^{bc}	97.30^{a}	96.63^{ab}	94.83^{c}	0.67*

^{a,b,c,d}: Means within the same row bearing different superscripts are significantly different (P<0.05)
SEM: Standard Error of Mean

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