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Original article

Effects of two herbal feed additives with or without grits on carcass evaluation of broiler chickens

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ABSTRACT

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An eight-week study was conducted to investigate effects of two herbal feed additives with or without grits on carcass evaluation of broiler chickens. One hundred and forty-four day-old unsexed Cobb broiler chicks were randomly assigned to six treatments of twenty four birds per treatment with three replicates of eight birds each. Six dietary treatments were formulated with the inclusion of *Moringaoliefera* leaf meal (MOLM), *Garcinia kola* seed meal (GKSM) and grits. The experimental rations contained diet without MOLM, GKSM and grits which served as treatment 1 (control), with MOLM at 1000ppm (treatment 2), with GKSM at 1000ppm (treatment 3), with grits at 1000ppm (treatment 4), with MOLM at 1000ppm + grits at 1000ppm (treatment 5) and with GKSM at 1000ppm + grits at 1000ppm (treatment 6). Data were collected on carcass evaluation and subjected to analysis of variance in a completely randomised design. The proximate composition revealed that MOLM had higher crude protein (21.96%), crude fat (4.87%), crude fibre (15.61%) and ash (9.32%) than those found in GKSM. back was significantly ($p < 0.05$) higher in birds fed GKSM + grits though comparable to 384.83 and 377.36g recorded in the control and groups fed GKSM only respectively. The kidney value

of those fed GKSM + grits (6.51%) was significantly ($p < 0.05$) higher compared to those fed grits only and MOLM + grits (3.37% and 2.83%) respectively. Carcass traits (cut parts) were not affected ($p > 0.05$) by the dietary treatments. From the results of this study, it can be concluded that the bird fed control diet had highest value for back%, those fed GKSM + grit had highest value for kidney% and those fed grit had highest value for caeca%.

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1. Introduction

Feed additives are added to animal feed to improve their nutritive value, boost animal performance by improving their growth rate, giving better feed conversion efficiency, greater liveability and lowered mortality in poultry birds. In the past, growth-promoting antibiotics were used as feed additives; however, these were associated with residues in the meat and eggs by consumers, and have been banned or limited in many countries (Diarra et al., 2011).

Animal scientists and veterinarians are now turning attention towards alternative sources of natural ingredients such as herbs or phytochemicals (phytobiotics) to replace antibiotics. There were reports on the beneficial effects of herbs which are used as feed supplements or medicines in chickens (Guo et al., 2003; Ogbe et al., 2009). Research works on herbal formulations as feed additives have shown encouraging results as regards weight gain, feed efficiency, lowered mortality and increased liveability in poultry birds (Kumar, 1991; Babu et al., 1992; Mishra and Singh, 2000; Deepak et al., 2002; Jahan et al., 2008).

Moringaoleiferawas claimed to boost immune systems (Jayavardhanan et al., 1994; Fuglier, 1999; Olugbemi et al., 2010). The leaves and green fresh pods are used as vegetables by man and are rich in carotene and ascorbic acid (vitamin C) with a good profile of amino acids (Makkar and Becker, 1996). *Moringaoleifera* extract was reported to have antibacterial properties and conclusion was made to investigate it as a phytotherapeutic agent to combat infectious agents (Patel, 2011).

Bitter kola (*Garcinia kola*) is used as food and herbal medicine (Adesanya et al., 2007). *Garcinia* spp are known to have a complex mixture of phenolic compounds including biflavonoids, xanthenes and benzophenones (Iwu et al., 1990). The phenolic compounds possess anti-inflammatory, anti-microbial, anti-diabetic and antiviral properties (Adedeji et al., 2006).

Grits are hard bit of stone, sand and small particles used by birds to enhance mechanical digestion by abrasion in the gizzard (Atteh, 2003). It was also reported that grit can improve the efficiency of feed utilization by the birds and increase average feed intake (Atteh, 2003). It is also thought that these stones aid the digestion of materials which the chicken picks up (Salverson, 1996).

Also, birds reared under intensive management have no access to sand grit and hence ability to digest high fibre content of their regular diets is very low (Adeniji and Oyeleke, 2008). There is possibility that incorporation of grits into the diets of the intensively reared birds may increase the amount of nutrients extractable (Adeniji, 2009).

Therefore, this study was aimed at assessing the effects of combining these two herbal feed additives with or without sand grits on carcass evaluation in broiler chickens.

2. Materials and methods

2.1. Experimental site

The experiment was carried out at the poultry unit of Directorate of University Farms, Federal University of Agriculture Abeokuta. The area lies on latitude $7^{\circ}10'N$ and longitude $3^{\circ}2'E$, it is 76m above sea level and located in the tropical rain forest vegetation zone with an average temperature of $34.7^{\circ}C$ and relative humidity of 82% (Google Earth, 2012).

2.2. Sourcing and processing of test ingredients

The moringa leaves were obtained from an established moringa plot in Abeokuta, Ogun state. The *Garcinia kola* seeds were purchased from Lafenwa market in Abeokuta, Ogun state and the sand grits of around 2mm size were obtained from a beach in Ikorodu, Lagos state. The harvested moringa leaves were air dried in the shade until they were crispy to touch, while retaining their greenish colouration. The leaves were then milled using a hammer mill to obtain a product herein referred to as *Moringaoleifera* leaf meal (MOLM) of size 0.5mm. The *Garcinia kola* seeds were sun-dried and ground using hammer mill and referred to as *Garcinia Kola Seed Meal* (GKSM). The sand grits were sun dried. All the test ingredients were later stored in sacs until needed.

2.3. Experimental birds and management

One hundred and forty four (144) day old Cobb broiler chickens were used for the experiment. They were randomly divided into six treatment groups of twenty four birds, each comprised of three replicates. The experimental diets were assigned to each of the six treatment groups; water was made available *ad-libitum*. Brooding was carried out for a period of about two weeks in order to keep the birds warm. The litters were changed frequently and vaccination schedules were strictly adhered to.

2.4. Experimental diet

Six experimental diets were formulated with the inclusion of herbal feed additives and grits as follows;

- Diet 1 - Basal (Diet without herbal feed additives and sand grit) diet (control)
- Diet 2 - Basal diet + *Moringaoleifera* leaf meal (1000ppm)
- Diet 3 - Basal diet + *Garcinia kola* seed meal (1000ppm)
- Diet 4 - Basal diet + grit (1000ppm)
- Diet 5 - Basal diet + *Moringaoleifera* leaf meal (1000ppm) + grit (1000ppm)
- Diet 6 - Basal diet + *Garcinia kola* seed meal (1000ppm) + grit (1000ppm)

Table 1

Gross composition of the experimental diets (0-4 weeks).

Ingredients (%)	Control	MOLM	GKSM	Grits	MOLM + Grits	GKSM + Grits
Maize	50.00	50.00	50.00	50.00	50.00	50.00
Wheat offals	8.00	8.00	8.00	8.00	8.00	8.00
Soybean meal	22.00	22.00	22.00	22.00	22.00	22.00
Groundnut cake	10.30	10.30	10.30	10.30	10.30	10.30
Palm Kernel Cake	2.00	2.00	2.00	2.00	2.00	2.00
Fish meal	3.00	3.00	3.00	3.00	3.00	3.00
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00
Oyster shell	2.00	2.00	2.00	2.00	2.00	2.00
Lysine	0.10	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10	0.10
Salt	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin&Mineral Premix	0.25	0.25	0.25	0.25	0.25	0.25
MOLM	-	+	-	-	+	-
GKSM	-	-	+	-	-	+
Grits	-	-	-	+	+	+
Total	100	100	100	100	100	100
Calculated Chemical Composition						
ME (Kcal/Kg)	2835.13	2835.13	2835.13	2835.13	2835.13	2835.13
CP (%)	22.44	22.44	22.44	22.44	22.44	22.44
CF (%)	4.03	4.03	4.03	4.03	4.03	4.03
Fat (%)	4.29	4.29	4.29	4.29	4.29	4.29
Ca (%)	1.66	1.66	1.66	1.66	1.66	1.66
P (%)	0.82	0.82	0.82	0.82	0.82	0.82

*Premix to provide the following: Vitamin A 12,000,000I.U; Vitamin D3 3,000.000I.U; Vitamin E 30,000mg; Vitamin K 2,500mg; folic acid

1,000mg; Niacin 40,000mg; Cal Pan 10,000mg; Vitamin B12 20mg; Vitamin B12,000mg; Vitamin B6 3,500mg; Biotin 80mg; Antioxidant 125,000mg; Cobalt 250mg; Selenium 250mg; Iodine 1,200mg; Iron 40,000mg; Manganese 70,000mg; Copper 8,000mg; Zinc 60,000mg; Chlorine 200,000 mg. + = 1000ppm, MOLM= *Moringaoleifera* leaf meal, GKSM= *Garcinia kola* seed Meal.

Table 2

Gross composition of the experimental diets (5-8 weeks).

Ingredients (%)	Control	MOLM	GKSM	Grits	MOLM + Grits	GKSM + Grits
Maize	54.00	54.00	54.00	54.00	54.00	54.00
Wheat offals	10.00	10.00	10.00	10.00	10.00	10.00
Soybean Meal	16.00	16.00	16.00	16.00	16.00	16.00
Palm kernel cake	3.00	3.00	3.00	3.00	3.00	3.00
Groundnut cake	9.30	9.30	9.30	9.30	9.30	9.30
Fish meal	3.00	3.00	3.00	3.00	3.00	3.00
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00
Oyster shell	2.00	2.00	2.00	2.00	2.00	2.00
Lysine	0.10	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10	0.10
Salt	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin&Minreal	0.25	0.25	0.25	0.25	0.25	0.25
Premix						
MOLM	-	+	-	-	+	-
GKSM	-	-	+	-	-	+
Grits	-	-	-	+	+	+
Total	100	100	100	100	100	100
Calculated Chemical Composition						
ME (kcal/kg)	2875.33	2875.33	2875.33	2875.33	2875.33	2875.33
CP (%)	20.24	20.24	20.24	20.24	20.24	20.24
CF (%)	3.98	3.98	3.98	3.98	3.98	3.98
Fat (%)	4.27	4.27	4.27	4.27	4.27	4.27
Ca (%)	1.65	1.65	1.65	1.65	1.65	1.65
P (%)	0.82	0.82	0.82	0.82	0.82	0.82

*Premix to provide the following: Vitamin A 12,000,000I.U; Vitamin D3 3,000.000I.U; Vitamin E 30,000mg; Vitamin K 2,500mg; folic acid 1,000mg; Niacin 40,000mg; Cal Pan 10,000mg; Vitamin B12 20mg; Vitamin B12,000mg; Vitamin B6 3,500mg; Biotin 80mg; Antioxidant 125,000mg; Cobalt 250mg; Selenium 250mg; Iodine 1,200mg; Iron 40,000mg; Manganese 70,000mg; Copper 8,000mg; Zinc 60,000mg; Chlorine 200,000mg. + = 1000ppm, MOLM= *Moringaoleifera* leaf meal, GKSM= *Garcinia kola* seed Meal.

2.5. Data collection

The following data were collected over the 56-day experimental period;

Chemical analysis:

Proximate analysis of the test ingredients was carried out according to the method of AOAC. (1990).

Carcass evaluation:

At the end of the 56 days feeding trial, one bird per replicate was randomly selected, weighed and slaughtered for carcass evaluation. Prior to slaughtering, the sampled birds were starved overnight. Live weight, dressed weight, dressing percentage, cut up parts (thighs, drumstick, breast, back, wings, head, neck, shanks and organs such as gizzard, liver, lungs, kidney and abdominal fat) were excised and weighed. The weights were expressed as a percentage of the live weight.

Statistical analysis:

The experimental design was a Completely Randomized Design (CRD) and data obtained were subjected to one-way Analysis of Variance using SAS (1999). Significant ($P < 0.05$) means among variables were separated using Duncan Multiple Range Test as contained in the SAS (1999) package.

Experimental model:

$$Y_{ij} = \mu + T_i + \sum_{ij}$$

μ =Population mean
 T_i =Effect of dietary treatments
 \sum_{ij} =residual error

3. Results

Table I and II show the gross composition of the diets at starter and finisher phases respectively. The results of the proximate chemical composition analysis of the *Moringaoleifera* leaf meal (MOLM) and *Garcinia kola* seed meal (GKSM) are presented in Table III. The MOLM was found to contain crude protein (21.96%), ash (9.32%), moisture (8.82%), CF (15.61) and crude fat (4.87 %). The GKSM was found to contain moisture (9.24%), crude protein (7.93%), ash (3.21%), crude fat (2.66%) and crude fibre (5.83%).

Table 3

Proximate composition of *moringa oleifera* leaf meal and *garcinia kola* seed meal.

Fraction (%)	MOLM	GKSM
Moisture	8.82	9.24
Crude protein	21.96	7.93
Crude fat	4.87	2.66
Crude fibre	15.61	5.83
Ash	9.32	3.21
Nitrogen Free Extract	48.24	80.37

Table 4

Effects of MOLM, GKSM and Grits on carcass evaluation of the broiler chickens.

Parameters	Control	MOLM	GKSM	Grits	MOLM+Grits	GKSM+Grits	SEM
Final live weight	2333.33	2260.00	2366.67	2300.00	2366.67	2433.33	28.20
Plucked weight	2000.00	1966.67	2166.67	2100.00	2066.67	2200.00	36.38
Dressed Weight	1466.67	1583.33	1556.67	1566.67	1600.00	1650.00	57.74
Dressing%	62.81	69.94	65.77	68.20	67.31	67.86	10.31
Thighs%	10.61	9.68	10.00	10.32	11.15	9.76	0.28
Drum stick %	9.56	9.32	9.93	10.25	10.11	8.83	0.29
Breast %	20.35	19.87	24.00	21.67	20.97	21.54	0.56
Back %	16.43 ^a	13.26 ^b	16.00 ^a	14.58 ^{ab}	15.05 ^{ab}	16.73 ^a	0.39
Wings %	7.47	7.73	6.73	8.24	8.00	7.73	0.34
Head %	2.15	2.18	2.47	1.98	2.24	2.04	0.07
Neck %	3.79	3.95	4.31	3.46	4.01	4.18	0.17
Shanks %	3.66	3.86	4.02	3.33	3.73	3.07	0.14
Gizzard %	1.75	1.56	1.70	1.36	1.75	1.71	0.06
Liver %	1.58	1.65	1.66	1.58	1.94	1.59	0.06
Spleen %	0.07	0.11	0.09	0.11	0.07	0.08	0.01
Lungs %	0.49	0.57	0.73	0.56	0.58	0.60	0.03
Heart %	0.39	0.39	0.45	0.35	0.35	0.43	0.02
Kidney %	0.21 ^{ab}	0.19 ^{ab}	0.22 ^{ab}	0.15 ^b	0.12 ^b	0.27 ^a	0.02
Abdominal fat %	0.22	0.87	0.19	0.50	0.93	0	0.08
Caeca %	0.69 ^b	0.80 ^{ab}	0.97 ^{ab}	1.21 ^a	0.82 ^{ab}	0.94 ^{ab}	0.06
Large intestine%	0.09	0.12	0.13	2.94	0.11	0.08	0.47

^{ab} Means on the same row having different superscripts were significantly different (P<0.05).

Table IV shows the main effects of herbal feed additives and grits on carcass traits of the broiler birds at 8th week. The back was significantly (p<0.05) higher in birds fed GKSM + grits though comparable to 384.83 and

377.36g recorded in the control and groups fed GKSM only respectively. The kidney value of those fed GKSM + grits (6.51%) was significantly ($p < 0.05$) higher compared to those fed grits only and MOLM + grits (3.37% and 2.83%) respectively. The caeca value of those fed grits (27.57%) was significantly ($p < 0.05$) higher than those fed control diets (15.99%). Although, there were no significant ($p > 0.05$) differences in other carcass traits with values ranging from 1966.67g – 2200.00g for pluck weight, 1466.67g – 1650.00g for dressed weight, 62.81%- 69.94% for dressing percentage.

4. Discussion

The crude protein (CP) content of the MOLM used was 21.96% which was slightly lower than the CP values of 27.1% and 27.51% MOLM reported by Booth and Wickens (1988) and Oduro et al. (2008), respectively. The values obtained for the crude fibre (CF), 15.61% and crude fat (4.87%) of the MOLM were, however, similar to those reported by Oduro et al. (2008). Also, the CF value of 15.61% was lower than 19.20% reported by Booth and Wickens (1988). The variations in the nutrients could be attributed to the age of cutting or harvesting, climatic conditions, edaphic factors, agronomic practices as well as methods of processing and analysis.

The reported Crude protein, crude fat, crude fibre and ash for the bitter kola (7.93, 2.66, 5.83 and 3.21 respectively) in this study were different from what had previously been reported by Eleyinmi et al. (2006), with a protein content of 3.95%, crude fat of 4.33%, ash of 1.14% a crude fibre content of 11.4% in the seed. The low levels of crude protein, crude fibre and crude fats (indices of nutritional value) in *Garcinia kola* seeds lend credence to their being used as anti-obese agent (Iwu et al., 1990).

No significant difference in carcass dressing percentage was observed in broilers fed the experimental diets although the range values (62.81-69.94%) obtained in this study is not similar to those published by Oluyemi and Robert (2000), and Anyoehie and Madubuike (2007) who reported range values of 70-75%. The development of the eviscerated organs except the kidney was influenced by the feed additives used both solely and with grits. This result is also in agreement with that of Hernandez et al. (2004), who reported no differences in the mean weight of proventriculus, gizzard, intestine, liver and pancreas in broilers fed on two herbal plants extract. However, the result is also at variance with the report of Borin et al. (2006) who reported increased weight of intestines and gizzard in poultry fed cassava leaf meal. Ocaik et al. (2008) and Rahimi et al. (2011) reported no differences in carcass and organs' weight of broilers fed a diet containing 2% thyme powder and 0.1% thyme extract respectively.

5. Conclusion

It can be concluded that MOLM had higher crude protein, crude fat, crude fibre and ash than GKSM. Also, the developments of the eviscerated organs except the kidney were influenced by the feed additives used both solely and with grits.

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