

APR-03

Growth Performance and Carcass Characteristics of Broiler Chickens Fed Moringa (*Moringa oleifera*) and Baobab (*Adansonia digitata*) Leaf Powders as Replacement for Synthetic Premix in Hot Tropical Environment

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Abstract

A total of one hundred and eighty (180) two weeks old broiler chickens were used for 49 days feeding trial to investigate the effects of *Moringa oleifera* leaf powder (MOLP) and baobab (*Adansonia digitata*) leaf powder (BLP) as replacement for commercial premix on growth performance and carcass characteristics. Six (6) experimental diets were formulated and designated as T1 which contained (0.30% synthetic premix), T2 (0.15% synthetic premix + 0.15% MOLP), T3 (0.15 synthetic premix + 0.15% BLP), T4 (0.15% MOLP + 0.15% BLP), T5 (0.30% MOLP), T6 (0.30% BLP). The chickens were randomly allotted to the six treatments with 30 chickens per treatment which were replicated thrice with 10 chickens per replicate in a Randomized Complete Block Design (RCBD). Results obtained showed that, final live weight, total weight gain, total feed intake were significantly ($P < 0.05$) different among treatment groups with the exception of feed conversion ratio. Carcass and organ weights showed no significant ($P > 0.05$) differences among the treatment groups. It may be concluded that MOLP and BLP can completely be used to replace synthetic premix without adverse effects on growth performance and carcass parameters of broiler chickens.

Keywords: Moringa, baobab, premix, performance, broiler chickens

Introduction

Several alternatives have been proposed as growth promoters such as organic acids and medicinal plants as natural feed additives and now they are being used in poultry diets to enhance performance and immune response of birds (Saki *et al.*, 2012). Two of such plants are Moringa (*Moringa oleifera*) and Baobab (*Adansonia digitata*). Olugbemi *et al.* (2010) reported that *Moringa oleifera* leaves have antimicrobial effects and are good sources of fats, proteins and minerals. *Moringa oleifera* leaves are known to contain 23% crude protein, 2868 MJ/kg ME and possess 79.70% digestibility (Beckker, 1983). David *et al.* (2012) reported that replacing antibiotic growth promoter with *Moringa oleifera* leaf powder (MOLP) at 0.1 or 0.05% levels have beneficial effects on growth performance and carcass yield of broiler chickens. Similarly, baobab leaf powder (BLP) is also an alternative protein source of plant origin. Hankey (2004) reported that, BLP is rich in vitamin C, potassium, calcium and sugar. Similarly, Feedipedia (2013) showed that the crude protein content of BLP was 5 to 17%, fibre; 10 to 19% and calcium; 1 to 4%. The nutritional contents of BLP serve as the basis for inclusion in broiler chicken diets for growth performance.

The objective of this study was to assess the growth performance and carcass characteristics of broiler chickens fed Moringa and baobab leaf powders as a replacement for synthetic premix.

Materials and Methods

The study was carried out at the poultry unit of the livestock Teaching and Research Farm, Department of Animal Science, University of Maiduguri. Maiduguri is located between latitude 11°05' and 12° North and longitude 13°05' and 14° East and at an altitude of 354M above sea level (Encarta, 2007). The ambient temperatures could be as low as 20°C during the dry cold season (October to January) and as high as 44°C during the dry hot (February to May) and the relative humidity is about 5% in April and May and the day length varies from 11 to 12 hours (Raji *et al.*, 2009). One hundred and eighty (180) two weeks old broiler chickens were used for the study. The chickens were assigned to six (6) dietary treatments designated as treatments 1 which contained (0.30% synthetic premix), T2 (0.15% synthetic premix + 0.15% MOLP), T3 (0.15% synthetic premix + 0.15% BLP), T4 (0.15% MOLP + 0.15% BLP), T5 (0.30% MOLP) and T6 (0.30% BLP). The chickens were allotted to the six dietary treatments in groups of 30 per treatment and replicated thrice with 10 chickens per replicate in a Randomized Complete Block Design (RCBD). The Study lasted for 49 days. The ingredients composition and calculated analyses of the experimental broiler finisher diet is presented in Table 1.

The following data were collected during the study: final live weight, total weight gain, total feed intake and feed conversion ratio (FCR). All feed sample collected were analyzed using AOAC (2006) methods. At the end of the experiment, six (6) chickens were randomly selected from each treatment which were deprived of feed for 12 hours and slaughtered for carcass analyses. Slaughter weight, plucked weight, dressed weight, as well as the weights of head, neck, wings, thighs, shanks, abdominal fats and

visceral organs such as heart, liver, lungs and gizzard were excised and weighed. The dressed weight was compared with the live weight to obtain the dressing percentage.

$$\text{Dressing percentage} = \frac{\text{Dressed weight}}{\text{Live weight}} \times 100$$

All cut-up parts and the organ weights were expressed as percentage of live weight.

All data collected were subjected to analyses of variance (ANOVA) using the software statistix 9.0 version (Statistix, 2008) and significant means were separated by Least Significant Difference (LSD).

Table 1: Ingredients Composition and calculated analysis of the experimental broiler finisher diets

Ingredient	Treatments / Diets					
	T1	T2	T3	T4	T5	T6
Maize	54.00	54.00	54.00	54.00	54.00	54.00
Soybean	28.00	28.00	28.00	28.00	28.00	28.00
Wheat offal	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
Premix	0.30	0.15	0.15	0.00	0.00	0.00
Moringa leaf powder	0.00	0.15	0.15	0.00	0.30	0.00
Baobab leaf powder	0.00	0.00	0.15	0.15	0.00	0.30
Methionine	0.20	0.20	0.20	0.20	0.20	0.20
Lysine	0.20	0.20	0.20	0.20	0.20	0.20
Salt	0.30	0.30	0.30	0.30	0.30	0.30
Total	100.00	100.00	100.00	100.00	100.00	100.00
Calculated Analysis						
Crude protein (%)	20.29	20.39	20.31	20.35	20.38	20.32
Crude fibre (%)	4.48	4.50	4.50	4.53	4.54	4.52
Ether extract (%)	8.27	8.28	8.28	4.28	4.28	4.29
Ash	2.91	2.92	2.92	2.93	2.94	2.93
Nitrogen free extract	52.62	52.67	52.72	52.77	52.73	52.65
Calcium (Ca)	0.16	0.16	0.16	0.16	0.16	0.16
Phosphorus (PH)	0.44	0.46	0.46	0.47	0.47	0.47
ME (kcal/kg)	3179.50	3179.50	3179.50	3179.50	3179.50	3179.50

ME = Metabolizable Energy (Kcal/kg) * Premix supplying the following per kg of feed. Vit. A = 50,000,000IU, Vit D₂ = 1,600,000IU, Thiamin = 2000Mg, Riboflavin = 5,000mg, Panthotenic acid = 10,000, Vit. B₆ = 3000mg, Vit. B₁₂ = 20mg, Vit. K = 100mg, E = 20,000mg, Vit. C = 100,000mg, Nicotinic acid = 25,000mg, Folic acid = 600mg, biotin = 0.5mg, Manganese = 100,000mg, Iron = 80,000mg, Zinc = 49,000mg, Copper = 5,000mg, Iodine = 200mg, Cobalt = 250mg, Selenium = 125mg, Choline chloride 400,000mg, Zinc bacitracin = 15,000mg, Farmers UGF = 75,000mg

Results and Discussion

Growth performance of broiler chickens is presented in Table 2. The final live weight, total weight gain and total feed intake were significantly ($p < 0.05$) different among treatment groups with the exception of feed conversion ratio (FCR). Highest final live weight, total weight gain and total feed intake were observed in T3 (0.15% synthetic premix + 0.15% BLP) and the lowest values were observed in T2 (0.15% synthetic premix + 0.15% MOLP). The higher values of final live weight, total weight gain and better FCR observed in T3 agreed with the report of Rafiu *et al.* (2017) who reported that, birds on 50% baobab leaf meal had better performance. The lowest performance observed in T4 was probably due to the tannin and other antinutritional factors in Moringa and baobab leaves (Becker *et al.*, 1983) which depressed growth and feed utilization (Douglas *et al.*, 1993).

Table 2: Growth performance of broiler chickens fed Moringa (*Moringa oleifera*) and Baobab (*Adansonia digitata*) leaf powders replacing synthetic premix

Constituents (%)	Treatments /Diets						SEM
	T1	T2	T3	T4	T5	T6	
Initial live weight (g)	576.25	552.00	560.65	555.00	570.80	555.80	9.20 ^{NS}
Final live weight (g)	1628.80 ^{ab}	1456.40 ^b	1775.90 ^a	1511.20 ^{ab}	1635.10 ^{ab}	1681.20 ^{ab}	98.20 [*]
Total weight gain (g)	1052.50 ^{ab}	904.40 ^b	1215.50 ^a	956.20 ^{ab}	1064.30 ^{ab}	1125.40 ^{ab}	97.40 [*]

Total feed intake (g)	4393.40 ^{ab}	4598.80 ^{ab}	4882.90 ^a	4257.00 ^b	4572.80 ^{ab}	4773.40 ^{ab}	149.74 [*]
Feed conversion ratio	4.20	4.80	3.90	4.90	4.50	4.30	0.39 ^{NS}

a,b = Means bearing different superscripts within the same row differ significantly ($P < 0.05$), NS = Not significant ($P > 0.05$), SEM = Standard error of means.

Results for carcass parameters and organs weight are presented in Table 3. Slaughter weight, plucked weight, dressed weight and dressing percentage showed no significant ($P > 0.05$) differences among treatment groups and all were close to the values reported by Olomu (2011) for broiler chickens at nine weeks of age. However, the dressing percentage 71.65 to 76.75% obtained in this study were higher than 70.75% reported by Ravindran and Savakanessan (1996) as an ideal dressing percentage for well finished broiler chickens. The higher values recorded signifies that inclusion of moringa or baobab leaf powder in broiler chicken diets provide adequate nutrients to be utilized. The cut-up parts expressed as percentage of live weight and the visceral organs also showed no significant ($P > 0.05$) differences among treatment groups. This carcass result agreed with the findings of David *et al.* (2012) who reported that replacing antibiotic growth promoters with Moringa (*Moringa oleifera*) leaf powder at 0.1 or 0.05% has beneficial effect on growth performance and carcass yield of broiler chickens.

Table 3: Carcass characteristics and organ measurements of broiler chickens fed Moringa (*Moringa oleifera*) leaf powder (MOLP) and Baobab (*Adansonia digitata*) Leaf Powder (BLP) replacing synthetic premix

Parameters	T1	T2	T3	T4	T5	T6	SEM
Final liveweight (g)	2042.50	1937.50	2161.00	1890.00	1953.80	2107.50	203.72 ^{NS}
Slaughter weight (g)	1996.30	1878.80	2106.30	1775.00	1885.00	2018.70	194.35 ^{NS}
Plucked weight (g)	1853.00	1797.50	2025.00	1725.00	1830.00	1920.00	202.40 ^{NS}
Dressed weight (g)	1511.30	1437.50	1575.00	1350.00	1400.00	1460.00	155.95 ^{NS}
Dressing percentage (%)	71.65	76.50	76.75	72.75	75.50	75.50	3.56 ^{NS}
Cut-up parts as percentage of live weight							
Head (%)	2.13	2.37	2.28	2.42	2.27	2.39	0.22 ^{NS}
Shank (%)	3.04	3.69	3.55	3.37	3.38	3.37	0.37 ^{NS}
Wing (%)	7.96	8.11	7.66	7.40	7.47	7.71	0.42 ^{NS}
Neck (g)	5.08	5.13	5.07	5.36	4.96	4.34	0.48 ^{NS}
Thigh (%)	11.49	11.31	11.77	11.30	10.87	10.90	0.44 ^{NS}
Drum stick (%)	9.52	10.25	9.19	9.13	9.35	10.14	1.10 ^{NS}
Back (%)	14.71	14.81	15.23	14.84	15.10	14.10	1.10 ^{NS}
Breast (%)	20.60	19.10	21.23	19.73	19.10	20.08	1.09 ^{NS}
Organs and visceral content weight as % of live weight							
Gizzard (%)	2.72	2.73	2.53	2.88	2.99	2.86	0.36 ^{NS}
Proventriculus (%)	0.54	0.59	0.59	0.52	0.66	0.69	0.11 ^{NS}
Liver (%)	2.45	2.09	2.17	2.17	2.39	2.14	0.22 ^{NS}
Heart (%)	0.47	0.54	0.50	0.48	0.57	0.50	0.06 ^{NS}
Abdominal fats (%)	2.94	2.06	3.04	3.09	2.30	1.83	0.54 ^{NS}
Intestine (%)	5.34	5.86	5.52	5.40	6.27	5.79	0.81 ^{NS}
Caeca (%)	0.64	0.83	0.79	0.80	0.85	1.05	0.16 ^{NS}

MOLP = *Moringa oleifera* leaf powder, BLP = Baobab leaf powder, T1 = 0.30% synthetic premix, T2 = synthetic premix + 0.15% MOLP, T3 = 0.15% synthetic premix + 0.15% BLP, T4 = 0.15% MOLP + 0.15% BLP, T5 = 0.30% MOLP, T6 = 0.30% BLP.

Conclusion

Based on this result, it can be concluded that Moringa (*Moringa oleifera*) and/or Baobab (*Adansonia digitata*) leaf powders are suitable replacement for synthetic premix in broiler chickens diets without adverse effects on growth performance and carcass characteristics.

Recommendations

From the result obtained; Moringa (*Moringa oleifera*) and baobab (*Adansonia digitata*) leaf powders can be used as an alternative source to synthetic premix in broiler chicken diets where they are cheap and available. There is need for further studies to investigate the effect of *Moringa oleifera* and baobab (*Adansonia digitata*) as substitute for synthetic premix in the diet of laying chickens which was not covered in this study.

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