Asian Journal of Research in Animal and Veterinary Sciences

6(2): 20-27, 2020; Article no.AJRAVS.59472

Growth Performance, Carcass Characteristics and Heamatology Indices of Broiler Chicken Fed Graded Levels of (*Mangifera indica*) Mango Leaf Meal

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Authors' contributions

This work was carried out in collaboration among all authors. Authors HAAT and VOA designed the study. Authors OCJ, SH and AYS performed the analysis and authors DOO and MAA wrote the first draft of the manuscript. Authors HAAT, VOA and DOO supervised and analyzed the data. All the authors managed the literature search writing of the final manuscript. All authors read and approved the final manuscript.

Article Information

Editor(s):
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Complete Peer review History: http://www.sdiarticle4.com/review-history/59472

Original Research Article

Received 25 May2020
Accepted 30 July 2020
Published 19 August 2020

ABSTRACT

The use of leaf meals as an alternative to feed ingredient is gaining popularity. This study seeks the effect of feeding diet containing graded levels of (*Mangifera indica*) mangoes leaf meal on the growth performance and carcass characteristics of broiler chickens. A total of three hundred Arbor Acres breed day old broiler chicks were obtained from a commercial hatchery with an average (40±0.12g) body weight, weighed individually and randomly divided into five (5) Dietary Treatment groups (Treatment 1: control; Treatment 2: 2.5% Mango leaf meal MLM; Treatment 3: 5.0% MLM; Treatment 4: 7.5% MLM and Treatment 5: 10.0% MLM) with six replicates per treatment and ten birds per replicate in a completely randomized design. The experiment was conducted for the period of eight weeks. The daily feed consumption, weekly body weight, weight gain and feed conversion

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ratio were properly recorded. Carcass performance and hematology parameters were measured. Data were analysed using ANOVA at $\alpha_{0.05}$. There was no significant difference between the control and treatment groups in the initial, final, weight gain, daily weight gain, and feed conversion ratio. Feed intake was significantly higher ($P<0.05$) in broiler chicken fed control and 2.5% MLM which least feed intake and daily feed intake in broiler chicken fed both 7.5 and 10% MLM. No significant difference was noticed in the live weight, bled, defeathered weight and dressing percentage. But broiler chicken fed 7.5% MLM had higher dressing percentage. Eviscerated weight was significantly higher in broiler chickens fed 5.0% mango leaf meal with least value in broiler chickens fed 10.0% MLM. Heamoglobin, packed cell volume and Mean Corpuscular Hemoglobin Concentration (MCHC) shows no significant differences. The red blood cell (RBC) was higher in broiler chickens fed control and 5.0% MLM with least RBC in broiler chickens fed 2.5 and 10.0% MLM. Mean corpuscular volume (MCV) was significantly higher in blood from chicken fed 2.5% MLM with lower MCV in chicken fed 5.0%. The same trend was observed for MCH Mean Corpuscular Hemoglobin. There was no significant difference in all the white blood differential count including the white blood cell itself except for eosinophil which was higher in chickens fed 5.0% MLM with least value obtained in chicken fed 7.5% MLM. In conclusion 7.5% MLM can be added to broiler chicken feed because it shows a better growth performance with lowest feed conversion ratio and daily feed intake without any advert effect on the health status of the chicken.

Keywords: Mango leaf meal; growth performance; carcass characteristics; heamatolog; feed conversion ratio.

1. INTRODUCTION

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The increase in feed price lead to the increase in total production cost and thus decrease the profit margin of broiler industry. Attempt has recently been taken to reduce the cost of feed, including non-conventional feed ingredients.

The incorporation of leaf meal is primarily subjected to reduce the use of protein-rich feed ingredients in broiler rations and, hence, reduce the cost of feeds [1]. The other is to take the advantages from the bioactive components in leaf meal to improve the growth performance of broiler chicks [1].

Such leaf meal is mango leaf meal(MLM). Mango tree (*Mangifera indica* L.), which is known as an important fruit species worldwide, grows in almost all ecological zones of the tropical countries of the world. It is a typical multipurpose tree for its industrial and medicinal applications, which has significant economic values. Mango leaves have high content of phenolic compounds containing mangiferin, flavonoids, benzophenone, and gallotannins [2]. It has been reported that the mango leave extract is rich in potent antioxidant phenolic compounds [3] and has a high antioxidant activity, which is higher than that of β-carotene [4].

It has been known that some particular foliages contain a number of bioactive compounds that are beneficial for the health of chickens [5]. These compounds includes vitamins, phenolic acids, flavonoids, isothiocyanates, tannins as well as saponins [6]. In this regard, the use of leaf meal in rations may not only reduce the cost of feeds, but also elicit the health-promoting effect on broiler chickens. Apart from their benefits, the use of leaf meals in broiler diets may be limited by their high content of crude fibre [7,8]. In general, broiler chickens showed low tolerance to dietary fibre, and therefore feeding diets containing high levels of leaf meal may impose in compromised nutrient digestibility and thus alleviated growth performance of broilers [9].

The use of mango kernel had been well documented. In India, mango kernel is consumed by human beings in the form of porridge [10,11] but in Nigeria it is regarded as waste thus contributing to environmental pollution. There are few reports on the use of mango kernel in livestock feeding but the level of inclusion in poultry diets has been low because of the presence of tannins which have been reported to reduce chick growth [12,13]. Body weight gain and feed consumption of broilers were adversely affected when 20% of dietary maize was substituted with raw mango kernel meal [13]. The uses of the mango leaf meal have not been well documented. Therefore, this study reports the effect of feeding diet containing graded levels of (*Mangifera indica*) mangoes leaf meal on the growth performance, carcass characteristics and heamatology indices of broiler chickens.

2. MATERIALS AND METHODS

2.1 Experimental Site

The experiment was conducted at Poultry Unit Division in Livestock Investigation Department of National Veterinary Research Institute, Vom Plateau State, Nigeria.

2.2 Experimental Animal and Management

A total of three hundred Arbor Acres breed day old broiler chicks were obtained from a commercial hatchery was used for the trial. An average (40±0.12g body weight) were weighted individually and randomly divided into five (5) Treatment with six replicate per treatment and ten birds per replicate. The brooding temperature was kept at an average of 26.5^0C from the first to second week of age. Thereafter, the temperature was lowered to 22^0C for the rest of experimental period. Wood shaving was used as litter material. At day old chicks (DOC), antibiotic and anti-stress were given to the birds for three days. From week two to three, first and second Infectious Bursal Disease Vaccine (IBDV) was administered. Then, at week four and five Anticocidial drug and Newcastle Disease Vaccine Lasota were given to the birds respectively. The experiment was conducted for the period of eight weeks. The daily feed consumption, weekly body weights, weight gain and feed conversion ratio were properly recorded. Carcass performance parameters were measured.

2.3 Blood Sample Collection

Blood samples was collected into labeled Ethylene-deamine-tetra-acetic acid (EDTA) treated tubes for haematological analysis evaluation. Evaluations was conducted according to the method described by [14].

2.4 Experiment Design

A completely randomized design was used.

2.5 Data Analysis

Data obtained was subjected to analyses of variance using SPSS statistical package version 25. Significant differences between treatment means were separated using Duncan's Multiple Range Test.

3. RESULTS

Table 2. shows the growth performance of broiler chickens fed mango leaf meal (MLM). There was no significant difference in the initial, final, weight gain, daily weight gain, and feed conversion ratio. Feed intake was significantly higher in broiler chicken fed control and 2.5% mango leaf meal (4281.67 and 4255.00g respectively) which least feed intake in broiler chicken fed both 7.5 and 10% MLM (3973.0 and 3878.33g respectively). Similar trend was observed for daily feed intake with least value obtained in broiler chicken fed 7.5% (49.66g). Table 3 shows the relative live weight of carcass characteristics of broiler chickens fed mango leaf meal. No significant difference obtained in the live weight, bled, defeathered weight and dressing percentage. But broiler chicken fed 7.5% MLM had higher dressing percentage. Eviscerated weight was significantly higher in broiler chickens fed 5.0% MLM with least value in broiler chickens fed 10.0% MLM.

Hematology of broiler chickens fed mango leaf meal (MLM) are shown in Table 4.Heamoglobin, packed cell volume and MCHC showed no significant differences. The red blood cell (RBC) was higher in broiler chickens fed control and 5.0% MLM with least RBC in broiler chickens fed 2.5 and 10.0% MLM. MCV was significantly higher in blood from chicken fed 2.5% MLM with lower MCV in chicken fed 5.0%. The same trend was observed for MVH.

Table 5. shows the white blood differential count of broiler chickens fed mango leaf meal (MLM). There was no significant difference in all the white blood differential count including the WBC itself except for eosinophil which was higher in chickens fed 5.0% MLM with least value obtained in chicken fed 7.5% MLM.

4. DISCUSSION

In this present study, there was no significant difference in the initial, final, weight gain, daily weight gain, and feed conversion ratio. This result was in line with the report of [15], who stated that there was no significant difference of dietary mango saponin supplementation on the growth performance of chicks at 21 d of age. Similar result was obtained by [16] who fed broiler chicken with neem leaf meal. Abel, et al. [17] report was in agreement with the findings of this present study. He stated that all the parameters measured with the exception of mean daily weight gain were not significantly

Table 1. Feed composition

Starter feed ingredients	**0%**	**2.50%**	**5.00%**	**7.50%**	**10.00%**	**Finisher feed ingredients**	**0%**	**2.50%**	**5.00%**	**7.50%**	**10.00%**
Maize	51.50	49.00	47.60	47.10	48.60	Maize	50.00	49.00	47.00	45.00	44.00
Wheat offals	10.00	10.00	10.00	9.00	8.00	Wheat offals	11.05	11.55	11.05	10.55	9.05
Soybean cake	18.00	18.00	18.00	18.00	16.00	Soybean cake	18.00	18.00	18.00	18.00	18.00
Groundnut cake	17.10	16.60	16.00	15.00	14.00	Groundnut cake	15.00	13.00	13.00	13.00	13.00
Mango leaf meal	0.00	2.50	5.00	7.50	10.00	Mango leaf meal	0.00	2.50	5.00	7.50	10.00
Bone meal	2.00	2.00	2.00	2.00	2.00	Bone meal	3.00	3.00	3.00	3.00	3.00
Limestone	0.50	0.50	0.50	0.50	0.50	Limestone	1.00	1.00	1.00	1.00	1.00
Premix	0.25	0.25	0.25	0.25	0.25	Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	Salt	0.25	0.25	0.25	0.25	0.25
Lysine	0.20	0.20	0.20	0.20	0.20	Lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20	Methionine	0.25	0.25	0.25	0.25	0.25
Total						Vegetable	1.00	1.00	1.00	1.00	1.00
						Total					
Calculated nutrient						Calculated nutrient					
Starter feed ingredients	**0%**	**2.50%**	**5.00%**	**7.50%**	**10.00%**	**Finisher feed ingredients**	**0%**	**2.50%**	**5.00%**	**7.50%**	**10.00%**
Crude protein	21.68	21.94	21.82	21.66	20.86	Crude protein	20.71	20.24	20.17	20.21	20.21
Enery	2877.15	2842.15	2815.40	2803.20	2805.00	Enery	2871.10	2850.90	2817.94	2796.20	2793.50
Calcium	1.00	1.03	1.07	1.12	1.16	Calcium	1.55	1.60	1.65	1.69	1.75
Phosphotus	0.60	0.62	0.64	0.65	0.65	Phosphotus	0.76	0.79	0.80	0.82	0.83
Lysine	1.16	1.15	1.13	1.11	1.04	Lysine	1.13	1.10	1.09	1.08	1.07
Methionine	0.51	0.51	0.50	0.49	0.48	Methionine	0.50	0.54	0.54	0.53	0.52
Fibre	3.91	3.87	3.80	3.66	3.44	Fibre	3.86	3.80	3.70	3.69	3.60

Table 2. Growth performance of broiler chickens fed mango leaf meal

Parameters	Control	2.5% Mango leaf meal	5.0% Mango leaf meal	7.5% Mango leaf meal	10.0% Mango leaf meal	SEM
Initial weight (g)	55.70	48.97	42.93	42.83	40.87	1.84
Final weight (g)	1293.00	1477.33	1203.33	1655.33	1275.00	82.45
Weight gain (g)	1237.30	1428.37	1160.40	1612.50	1234.13	92.39
Daily weight gain (g)	22.09	25.51	20.72	28.79	22.04	1.65
Parameters	**Control**	**2.5% Mango leaf meal**	**5.0% Mango leaf meal**	**7.5% mango leaf meal**	**10.0% Mango leaf meal**	**SEM**
Feed intake (g)	4281.67^{a}	4255.00^{a}	4092.67^{ab}	3973.00^{b}	3878.33^{b}	51.03
Daily feed intake (g)	53.52^{a}	53.19^{a}	51.16^{ab}	49.66^{c}	48.48^{b}	0.64
Feed Conversion Ratio	2.42	2.09	2.57	1.72	2.20	0.13

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

Table 3. Relative live weight of carcass characteristics of broiler chickens fed mango leaf meal

Parameters	Control	2.5% Mango leaf meal	5.0% Mango leaf meal	7.5% Mango leaf meal	10.0% Mango leaf meal	SEM
Bled weight(%)	93.33	96.00	97.12	96.61	94.70	0.85
Defeathered weight (%)	93.23	95.77	94.30	93.59	93.41	0.54
Eviscerated weight (%)	77.18^{ab}	75.51^{ab}	83.52^{a}	75.15^{ab}	72.77^{b}	1.45
Dressing percentage (%)	64.89	63.08	64.92	72.60	67.51	2.08

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

Table 4. Heamatology of broiler chickens fed mango leaf meal

Parameters	Control	2.5% Mango leaf meal	5.0 % Mango leaf meal	7.5% Mango leaf meal	10.0% Mango leaf meal	SEM
Red blood cell ($X10^{12}$)	2.13^{a}	1.23^{b}	2.17^{a}	1.83^{ab}	1.47^{b}	0.12
Heamoglobin (g/dL)	8.40	7.87	8.30	8.53	8.57	0.17
Packed cell volume (%)	35.67	31.67	31.67	34.00	30.00	1.04
MCV (%)	202.00^{ab}	255.33^{a}	154.33^{b}	185.67^{ab}	210.67^{ab}	12.5
MCH (%)	39.67^{c}	64.33^{a}	40.33^{c}	46.33^{bc}	60.33^{ab}	3.38
MCHC (%)	23.33	25.00	26.33	25.00	28.33	0.81

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

MCV- Mean Corpuscular Volume, MCH= Mean Corpuscular Hemoglobin, MCHC= Mean Corpuscular Hemoglobin Concentration

Table 5. White blood differential count of broiler chickens fed mango leaf meal

Parameters	Control	2.5% Mango leaf meal	5.0 % Mango leaf meal	7.5% Mango leaf meal	10.0% Mango leaf meal	SEM
White blood cell ($X10^{9}$)	6.13	5.27	5.87	62.00	58.00	1.53
Neutrophil (%)	13.33	18.33	14.67	15.33	17.00	0.80
Lymphocyte (%)	84.00	78.33	83.00	82.33	82.00	0.93
Monocyte (%)	1.00	2.00	2.00	1.33	0.00	0.40
Eosinphil (%)	1.67^{ab}	1.33^{ab}	3.67^{a}	0.33^{b}	1.00^{b}	0.41
Basophil (%)	0.00	0.00	0.00	0.00	0.00	0.00

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

(P>0.05) different among the treatment. In the current study, the positive responses of broiler chicken to MLM indicated its beneficial role in broiler growth. The non-significant difference among the treatment also indicate that the experimental diet did not pose any nutritional stress on the animals.

The physiological status and health of farm animals depends on the nutrition fed to the animal aside genetic and environment influence. Oloruntola, et al. [18]; the values of haematological traits are indicators of the nutritional status of the animals which was earlier reported by [19,20,21]. The present result obtained in this study shows no significant differences among all the haematological indices measured across the dietary groups which also fall within the normal range [22]. The result obtained could be due to the present of saponin and some flavonoids which promote the health status of those broiler chickens.

5. CONCLUSION

It can be concluded that 7.5% MLM an be added to broiler chicken feed because it shows a better growth performance with lowest feed conversion ratio and daily feed intake without any adverse effect on the health status of the chicken.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/59472