

The Effect of Feeding Different Levels of *Moringa oleifera* Leaf Meal on the Performance and Some Blood Parameters of Broilers

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Abstract: The study was carried out at the farm of the College of Animal Production of Science and Technology, at Hillat Kuku, during the period of 7-4-2014 to 7-6-2014. The aim of the study was to evaluate *Moringa oleifera* leaf meal (MLM) as alternative cheap source of protein in the diets of Arbaicher grower broiler chicken breed and also the study was aimed to find out the effect of *Moringa oleifera* on body weight of broilers and on blood parameters. Two hundred chickens, aged 21 days were used; the chickens were divided into four groups; a control group and three experimental groups. The four experimental groups provided consecutively with 0%, 2%, 4% and 5% *M. oleifera* leave /kg of feed daily for 21 days (Finisher diet), which was added to their daily feed, and the control group was fed a diet without *M. oleifera*. The results showed significant variations in the final body and daily weight gain. Group D birds recorded the highest values for packed cell volume (PCV), hemoglobin concentration (Hb), and red blood cells (RBCs), values were 42.70%, $4.31 \times 10^6/m^3$ and 16.2 respectively. Group C have recorded the highest values for mean cell hemoglobin concentration (MCHC). Significant differences were noticed for the red blood cells (RBCs) count, hemoglobin (Hb) and MCHC values among groups while no significant differences were observed between the control and group D. The mean values for PCV in group C and D were high while birds on the control diet had the least PCV value of 23.7%. Similarly birds of group B had the highest RBC value of $2.73 \pm 1.13 \times 10^6/m^3$ and highest HB value of 17.32 ± 0.70 , the least values were obtained by group C birds.

Keywords: Broilers, *Moringa oleifera*, Hemoglobin, Red Blood Cells, Packed Cell Volume.

1. Introduction

The high and increasing prices for animal feeds have compelled researchers in developing countries to direct their attention to non-conventional feeds, with particular emphasis on protein substitutes [8]. *Moringa oleifera* is among plants that can be used as a cheap protein supplement to improve digestibility of other diets. *Moringa oleifera* which is native to India, Red Sea and parts of Africa including Madagascar [21].

Moringa oleifera tree contains high crude protein (CP) in the leaves (251 g/kg DM) and negligible content of tannins and other anti-nutritive compounds, it offers an alternative source of protein to ruminants and non-ruminants [18] and [16] found that the nutrients composition and digestibility of *M. oleifera* /g/kg was DM 910.22, CP 210.04, CF 150.28, NDF 310.32, ADF 260.88, EE 60.25, Ash 80.89 and digestibility 790.5.

Half the protein content can be extracted from the leaves in the form of a concentrate that can be added to chicken feed [21]. According to [6], the nutrient value of *Moringa* leaves can be increased for chickens through the addition of phytase to break down phytate leading to increased absorption of phosphorus. If uncontrolled, raw *Moringa* added to poultry diets, can be dangerous because of high bio-availability of protein; therefore particular care must be taken to avoid excessive protein intake [8]. The active constituents in the leaves of *M. oleifera* are glucosinolates; e.g., 4-(alpha-L-rhamnosyloxy) benzyl glucosinolate which yield 4-(alpha-L-rhamnosyloxy) benzyl isocyanate following enzymatic degradation with myrosinase. Phenol carboxylic acids and fatty acids including oleic acid (60 to 70%), palmitic acid (3-12%) stearic acid (3-12%) as well as

eicosanoic acid and lignoceric acid in addition to mustard oil are other constituents. The antimicrobial effect of *M. oleifera* and of related species is related to the secondary metabolite constituents.

[3], found that MOLM inclusion in the diets up to 24% did not cause any adverse impact on live body weight, average daily weight gain, feed conversion ratio (FCR), mortality, carcass and organs characteristics in birds compared to their controls. According to [15] *Moringa* fed in high quantities (7.5 and 10%) to one-week old chicks resulted in reduced growth, indicating that higher levels of *Moringa* in chick diets has a detrimental effect on chick growth. [20] in Nigeria investigated the effects of MOLM on the performance and blood chemistry of starter broilers and found that MOLM could be included at 7.5% in broiler diets without any deleterious effect on performance and blood characteristics of broilers. The antimicrobial properties of the *Moringa oleifera* seed extracts may be due to lipophilic compounds. These compounds may attach to the cytoplasmic membrane. The extracts of *Moringa oleifera* seeds may contain antibiotic metabolites, such as carboxylic acid, 2, 4-diacetyl phloroglucinol, and cell wall-degrading enzymes and chitinases. The antioxidant effect of *Moringa oleifera* leaf extract and fruit was explained by Luqman et al. who noticed that it was due to the presence of polyphenols, tannins, anthocyanin, glycosides, and thiocarbamates, which remove free radicals and activate antioxidant enzymes [1]. *Moringa* was also reported to have a natural enzyme which aid digestion of fibrous food in animals [9].

A study by [26] found that *M. oleifera* when partially used to replace fish meal may hamper growth rate of broiler chickens. In Botswana, [14] evaluated the effects of MOLM

at 10% inclusion level on the growth rate of broilers and found that commercial broiler diet significantly ($P < 0.05$) promoted higher weight gain (1.04 kg) than MOLM. On the other hand, FCR was higher for birds on MOLM than those fed commercial diets. In Zimbabwe, [7] investigated the effects of supplementing soya bean meals with MOLM as a protein source in poultry and found no significant differences in feed conversion [13] found, significant differences in FCR were noted. It was concluded that inclusion of MOLM as protein supplement in broiler diets at 25% promoted more growth than commercial diets.

2. Materials and Methods

Study Area

The study was carried out at the farm of the College of Animal Production of Science and Technology, Sudan University of Science and Technology at Hillat Kuku, during the period of 7-4-2014 to 7-6-2014. The aim of the study was to evaluate *Moringa oleifera* leaf meal (MLM) as alternative cheap source of protein in the diets of grower chicken breeds and also the study was aimed to find out the effect of *Moringaoleifera* on body weights of broilers and on blood parameters. Two hundred broiler chickens; Arbaicher breed, aged 21 days were used. The chickens were divided into four groups; a control group and three experimental groups, The four experimental groups provided consecutively with 0%, 2%, 4% and 5% *M. oleifera* leave /kg of feed daily for 21 days (Finisher diet), which was added to their feed daily and the control groups were fed on their diets without *M. oleifera*.

Experimental Birds

Two hundred; twenty one day old chicks were used for the study after being left on the experimental site for a period of one week to acclimatize. The chicks were randomly assigned to four dietary treatments, such that there were 50 birds per treatment and each treatment replicated twice with 25 chicks per replicate. The birds were managed on deep litter floor and were provided with appropriate experimental diets daily and allowed to feed *ad libitum*, clean water was also provided daily. The chicks were subjected to similar conditions of management and sanitary conditions throughout the period of the experiment.

Experimental Diets

The Moringaleaves used in the preparation for the three experimental diets were purchased from the local farmer. The leaves were spread to dry under shade for two weeks thereafter; dried under a constant temperature of 30°C for 30 minutes in an oven to make them crispy for easy blending. Later milled with a hammer mill and sieved with 3 mm mesh to obtain the Moringaleaf meal which was incorporated into the diet at 0% for chicks, 2% for chicks and 4% level of inclusion for and 5% level of inclusion.

Table 1: Composition of the experimental diet

Group(C)	Group(B)	Group(A)	Ingredients
%71.3	%72	%75	Sorghum
%17.7	%18.7	%18	Ground cakes
%5	%5	%5	concentrate
%0.6	%0.7	%0.3	Calcium
%0.5	%0.5	%0.4	Lysine

%0.5	%0.5	%0.5	Vegetable oil
%0.3	%0.3	%0.3	Salt
%0.1	%0.2	%0.1	Wheat bran
%0	%0.1	%0.4	Methionine
4%	%2	%0	Moringa
%100	%100	%100	Total

Blood Collection

At the beginning and at the end of the experiment (five week period of the experiment), 2 ml of blood was collected from five randomly selected birds from each treatment via the wing vein into specimen bottles containing Ethylene Diamine TetraAcetic acid (EDTA), samples were subjected to hematological analysis. Packed cell volume was determined by Microhaematocrit method, haemoglobin content was determined by Cyanomethaemoglobin methods while the red blood cell were determined using haemocytometer of known dimensions.

Statistical Analysis:

Data collected were analyzed using Statistical Analysis Software (SAS, 2002)

3. Results

The results of the weight gain, feed conversion and hematological parameters in birds are shown in Table (3). The results show that weight gain, red blood cells count, hemoglobin concentration and mean corpuscular hemoglobin concentration increased ($P < 0.05$) in the birds fed 4% and 5% compared to control. The result showed that chicks on group C and D fed on *Moringa oleifera* leaves based diet performed significantly ($P < 0.05$) better than the birds of the control A group in terms of higher total weight gain (Group D 715.3g/b, Group C 715.3g/b. Group D birds had the highest PCV value of (42.7%) while birds on control diet had the least PCV value of (39.6%).

Table 2: The results of the weight gain, feed conversion and hematological parameters

Parameters	Group A (Control) 0%	Group B 2%	Group C 4%	Group D 5%
Average Weight gain/day (grams)	27.3±2.31 ^a	35.7±1.34 ^a	34.1±2.33 ^a	35.3±2.91 ^a
Average Total Weight gain (grams)	573.3±9.34 ^a	751.4±11.55 ^a	715.3±8.05 ^a	750±1.54 ^a
PCV (%)	39.6±1.52 ^a	40.5±1.52 ^a	40.0±2.10 ^a	42.7±2.80 ^a
Hb (grams)	15.0±0.581 ^a	15.9±0.668 ^a	16.3±0.763 ^a	16.2±1.22 ^a
RBC 10 ⁶ / _m	3.05±0.590 ^a	3.75 ±0.323 ^a	3.9 ±0.243 ^a	4.3±0.569 ^a
MCV (fl)	59.5±3.04 ^a	60.6±1.00 ^a	60.1±2.81 ^a	60.5±1.99 ^a
MCH (pg)	17.7±1.45 ^a	18.1±0.42 ^a	18.9±0.99 ^a	19.2±1.02 ^a
MCHC (%)	31.8±1.16 ^a	32.1±0.66 ^a	33.0±1.23 ^a	33.4±0.84 ^a

Means with different superscript within rows are significantly different ($P < 0.05$)

PCV = Packed cell volume; Hb = haemoglobin concentration; RBC = red blood cell count; MCV = mean corpuscular volume; MCHC = mean corpuscular haemoglobin concentration;

4. Discussion

The inclusion of MOLM in diet of broilers significantly ($P < 0.05$) enhanced the weight gain as compared to control group. The result showed that chicks of B, C and D fed on *Moringa oleifera* based diet performed significantly ($P < 0.05$) better than the birds of the control A group in terms of higher weight gain. This corroborates the report of [7] on high performance of birds fed *Moringa oleifera* based diet. The rich content of nutrients [25] and antimicrobial properties of *Moringa* [5] may be responsible for these findings. *Moringa oleifera* was also reported to have a natural enzyme which aid digestion of fibrous food in animals [9].

Findings from this study have shown that there are significant differences in the sum of the means of the PCV, Hb and Red blood cells across the groups ($P > 0.05$). Group D had the highest PCV; value of (42.70 %) while birds on control diet had the least PCV value of (33.6 %). The values fall within the normal range of (23-58%) reported for healthy birds [17] and also the values fall within the normal range of (40-43%) reported for healthy birds, [10] Similarly, birds on group D had the highest RBC value of ($4.3 \pm 0.569 \times 10^6/m$). The values are also within the normal range for chickens [11]. Red blood cells are responsible for the transportation of oxygen and carbon dioxide in the blood as well as the manufacture of haemoglobin, hence higher values indicates a greater potential for these function and a better state of health [19]. *Moringa oleifera* leaf meal contains iron (23mg/100g) which is necessary for many functions in the body including the formation of hemoglobin and myoglobin. *Moringa oleifera* was also reported to have a natural enzyme which aid digestion of fibrous food in animals [9]. The highest HB value of ($16.3 \pm 0.763a$) is recorded for birds in group C and the least is for those of the control. These values were higher than what was reported for broilers [23]. Also the values of MCV, MCH and MCHC followed the same trend as RBCs, Hb and PCV. The higher values maybe attributed to the influence of *Moringa oleifera* protein content which is rich in nutrients such as protein and minerals, on the haematological parameters. Inclusion of *Moringa oleifera* in the diet of broiler chicks resulted in increase in RBC, PCV and HB values confirming the findings of [7] who reported that *Moringa oleifera* has a blood boosting effect because for the high protein content.

As noticed in this study *M. oleifera* did not induce any toxic effect for the birds. This observation is in agreement with the report of [11], who reported that the *M. oleifera* did not induce any toxic effect in Wistar rats. It also agrees with the findings of [2], where *Moringa oleifera* seed extract was used at high doses of 400, 800 and 1600mg/kg with no resultant negative effect on the hematology of the female Wistar rats.

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