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INVESTIGATION THE EFFECTS OF DIFFERENT LEVELS OF MORINGA OLEIFERA LEAVES ON GROWTH PERFORMANCE AND SERUM BIOCHEMICAL PROFILE OF BROILER CHICKENS

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ABSTRACT

The aim of the study was to investigate the effect of feeding broiler chicks on diets containing two different levels of Moringa Oleifera leaf meal (MOLM) on productive performance, and blood constituents. A total 180, day-old unsexed Cobb 500 broiler chicks. The birds were randomly assigned into three different groups; each group was subdivided into three replicates (20 birds each). Group I served as control, and fed the basal diet only. Group II was fed the basal diet fortified 0.5% MOLM. Group III fed the basal diet with 1% MOLM. The results showed that, the birds that received 0.5% (MOLM) leaves on the top of the diet showed a significant ($P \leq 0.05$) improvement on overall FCR with significant decrease in total feed consumption than control group however, however birds that received 1% (MOLM) showed a significant ($P \leq 0.05$) improvement on final body weight development, average body weight gain and FCR with no significant difference in feed intake than control group. In addition to, blood indices showed that, that birds which fed on 0.5% MOLM had a significant decrease ($P \leq 0.05$) in total cholesterol, triglycerides, LDL than control but group fed on 1% MOLM showed a significant decrease liver enzymes activity as (ALT and AST) beside to total cholesterol, triglycerides, LDL and a significant increase in HDL, while two treated group showed a significant increase in total protein while bird fed on 1% MOLM showed a significant increase in Globulin portion. We safely concluded that dietary fortification of MOLM has a positive effect on broiler performance and blood constituent.

Key words:

Broiler, Moringa Oleifera, Performance, Blood indices.

INTRODUCTION

The use of antibiotic as growth promoters in poultry industry has been banned because of harmful effects on human health. This was observed by the development of microbial resistance to these products **(McCartney, 2002)**. Consequently; herbs, spices, and various plant extracts considered to be natural products that consumers would accept have received increased attention as possible feed additives such as antibiotic growth promoter replacements following their ban by the European Union in 2006 **(Catala-Gregori *et al.,* 2008)**. Several alternatives to these growth promoters have been proposed such as organic acids and medicinal plants as natural feed additives are now recently used in poultry diet to enhance the performance of the immune response of birds **(Saki *et al*., 2012)**. One such plant is Moringa oleifera,commonly known as the drumstick tree **(Makker and Becker, 1997)**.There are about 13 species of Moringa trees in the family Moringaceae. They are native to India, the Red Sea area and/or parts of Africa. Of these species, Moringa oleifera is the most widely known. In this document, the term 'moringa' refers to *M. oleifera*. All other species are referred to by their Latin name. In Egypt *M. oleifera* have been grown for decades in Aswan and North Sinai and have been a subject for research to increase the cultivated land. The leaves are highly nutritious and contain significant quantities of vitamins (A, B and C), calcium, iron, phosphorus and protein **(Murro *et al.,* 2003)**. Furthermore, heavy metals such as mercury, arsenic and cadmium which are potentially toxic are absent from the leaves of *M*. oleifera, thus /making their incorporation into poultry diet safe **(Donkor *et al.,* 2013).** Therefore, the objective of the present study was to evaluate the beneficial effects of Moringa oleifera leaf meal on the growth performance and blood constituent of broiler chickens.

MATERIAL AND METHODS

The feeding trial was carried out to investigate the impact of dietary fortification of chicory leaf feed on the growth performance and blood serum indices of broiler chickens.

Chickens, management and experimental design:

180, One day- old Cobb™ broiler chicks were randomly weighed and divided into three different groups; each group was 60 chicks and sub-divided into 3 replicates, each replicate was 20 birds, thus providing the following three experimental groups:

1st group was served as control and fed only the basal diet (Corn-soya based diet) without any dietary treatments.

2nd group was fed basal diet fortified with 0.5% Moringa oleifera leaves.

3rd group was fed basal diet fortified with 1% Moringa oleifera leaves.

Physical composition and calculated analysis of the basal diets are shown in **(**Table 1). The diets were formulated according to the Cobb® Manual for recommended nutrient requirements, 2015. Moringa oleifera leaves were collected from local fields in Egypt (Sadat city) and identified then dried by air under shelter and grinded by grinder according to stage of feeding from fine grinding in starter diet to coarse grinding in grower and finisher diet. All diets were offered to the birds in the form of mash. Starter diets was fed up to 10 day of bird's age and then grower diet till 21d then finisher diet till the end of the experiment at 5 wks. of age. Birds were provided with feed and water on an *ad libitum* basis during the entire experimental period. Clean wood shavings were used as litter and pens were equipped with an electrically heating system with continuous lighting maintained throughout the course of the experiment. All birds were vaccinated against Newcastle, Gumboro, IB and avian influenza following procedures recommended by the vaccine manufactures. Animal care was in compliance with applicable guidelines from Cairo University Policy on Animal Care and Use.

Data collection:

Growth performance responses.

The growth performance of broiler chickens were evaluated in terms of body weight gain (BWG), feed consumption (FC) and feed conversion ratio (FCR). Individual BWG of the birds were recorded at the beginning of the experiment and on a weekly basis thereafter. Weekly records of FC for each treatment were also maintained in order to calculate FCR (Feed: Gain).

Serum biochemical indices:

At 35 days of age, blood samples were individually collected from the wing vein of three birds per replicate. Serum was separated and frozen at-20°c until assayed. Determination of Serum total Protein **(Kaplan, and Szablo, 1983),** Serum Albumin **(Tietz and Saunders, 1990)**, Serum Globulin **(Tietz and Saunders, 1990**), Serum total cholesterol **(Ellefson and Caraway, 1976),** Serum Triglycerides **(Ramakrishnan and Sluochana, 2012**), Serum High Density Lipoproteins (HDL) **(Lopes Virella *et al.,* 1975)**, Serum Low Density Lipoproteins (LDL) **(Lopes-Virella *et al.,* 1975)** and Serum Very Low Density Lipoproteins (VLDL) **(Sharma *et al.*, 1987)** were carried out using photometric methods and diagnostic kits (SPECTRUM, Germany), kidney function was determined by evaluation of serum Creatinine **(Bartles *et al.,* 1972)**, serum Uric acid **(Barham and Tinder 1972)** and Liver function was

evaluated by determination of Aspartate Transaminase (GOT/AST**) (Reitman and Frankel, 1957)** and Alanine transaminase (GPT/ALT) **(Reitman and Frankel, 1957)** were carried out using photometric methods and diagnostic kits (SPECTRUM,Germany).

Statistical analyses:

All data collected were statistically analyzed using SPSS® version 18 **Software PC (2008).** Means are compared by one-way ANOVA ($P<0.05$) according to **(Snedecor and Cochran, 1980).**

RESULTS AND DISCUSSION

Growth performance indices:

Results of growth performance (body weight development, body weight gain, feed intake, FCR and cumulative growth performance during experimental period) between control group which fed on basal diet without any treatment and treated group which fed on different dose of moringa oliefera leaves are illustrated in (Table 2)**.** Results revealed that, the final body weight 1906.42 ± 24.9, 1919.25± 20.37 and 2001.83± 20.97 for control, 0.5% Moringa oleifera (MOLM) leaves and l% Moringa oleifera (MOLM) leaves respectively while the average total weight gain were 1868.03 ± 21.03, 1880.67 ± 28.62 and 1963.67 ± 14.83 respectively and the FCR were 1.89 ± 0.04, 1.74 ± 0.02 and 1.79 ± 0.02 respectively. It was noticed that, the birds that received 0.5% Moringa oleifera (MOLM) leaves on the top of the diet showed a significant ($P \leq 0.05$) improvement on overall FCR while, showed no significant difference on body weight development and average body weight gain with significant decrease in total feed consumption than control group however, birds that received 1% Moringa oleifera (MOLM) leaves on the top of the diet showed a significant ($P \leq 0.05$) improvement on final body weight development , average body weight gain and FCR with no significant difference in feed intake than control group which fed on basal diet without any treatment. The significant positive impact of Moringa oleifera (MOLM) leaves on growth performance criteria could be explained that, the fresh (MOLM) of high nutritional value as it is a good source of protein source of high true protein content that remain available in the intestine in addition to have adquant levels of all essential amino acids as arginine , histidine, lysine, tryptophan, threonine, methionine and valine also contain essential amino acids higher than the levels recommended by FAO with pattern comparable to those in soybean nearly protein content ranged from (22-24%) of high digest ability and low of anti-nutritional factor, also act as a good source of micronutrient as B-caroten, vitamine C, calcium, potassium,

magnesium, selenium, zinc which have a vital role in protein and carbohydrate metabolism as reported by **(James *et al*., 2017)** or may be flavinoid content which act as antibacterial (which have a beneficial effect on microbial environment on gut which enhance digestion and absorption and utilization of nutrient) and antioxidant as stated by **(Hassan *et al.,* 2016)** by so doubtless , reflect on improvement of growth performance parameter as FCR and body weightgain.this results isconfirmed by **(Paguia *et al.,*2014)**foundthatusing 0.20%,0.30%, 0.40% and 0.50% MOLM on broiler diets did not (P<0.05) significantly influence the broilers BW and BWG. Also in agree with **(Teteh *et al.,* 2013)** who showed that overall chick weights and daily BWG increased significantly with age (P<0.05) when used 1 and 2% MOLM compared to the control group and confirmed by **(Banjo, 2012)** investigated the effects of inclusion of four levels (i.e., 0%, 1%, 2% and 3%) of Moringa oleifera leaf meal on growth performance, significantly enhanced weight gain. But, not significantly enhance feed intake and feed conversion but unforurtnetlly, it is contrast with **(Divya *et al.,* 2014)** reported that There was no significant change in BW gain, feed intake and feed conversion ratio of broilers among the groups fortified with MOLM (0.5,1,1,1.5 and 2%) and control.

Serum biochemical indices:

The effects of dietary fortification of 0.5% and 1%MOLM leaves on liver function enzymes as Alanine Aminotransferase enzyme activity (ALT), Aspartate Amino transferase enzyme activity (AST), renal function indicators (Serum uric acid and serum creatinine), total cholesterol, triglycerides,High density Lipoproteins (HDL), Low density Lipoproteins (LDL), Very Low Density Lipoproteins (VLDL),Total Proteins, Albumin and Globulin are illustrated in **(**Table 3**)**. Results showed that birds which fed on 0.5% MOLM had a significant decrease (P ≤0.05) in total cholesterol , triglycerides, LDL with no any significant in liver enzymes activity as (ALT and AST) , and kidney function indicators (Serum uric acid and serum creatinine), HDL and VLDL than control but group fed on 1% MOLM showed a significant decrease liver enzymes activity as (ALT and AST) beside to total cholesterol, triglycerides , LDL and a significant increase in HDL with no significant difference in VLDL and albumin or kidney function indicators (serum uric acid and serum creatinine) than control while two treated group showed a significant increase in total protein while bird fed on 1% MOLM showed a significant increase in Globulin portion in contrast group fed on 0.5% MOLM which showed no improvement in globulin . the absence difference in ALT and AST reflect to normal liver function in group fed on 0.5% MOLM but when increase level of MOLM to 1%

lead to decrease level of liver enzyme as ALT and AST indicate to moringa oleifeira has a hepatoprotective effect (Enhance liver function) may be due to suggested that, the presence of antioxidants and sum of the phytochemicals in plants may act together to reduce the reactive oxygen species level more efficiently which effect on liver function enzymes depend on amount of phytochemical and antioxidant which increase by increasing inclusion rate of moringa oliefera in the diet. Such action might be attributed to better liver function in birds reared on Moringa containing feed and contributed to improve picture of hepatic enzymes as reported by **(Hu *et al.,* 2012)** and decreasing in total cholesterol and trigelycerides and LDL with increase HDL indicate that moringa olifera has a hypocholesterolemia may be due to moringa plants contain high amount of polyphenols flavonoids, alkaloids and phenolic compounds. These compounds possess the hypocholesterolaemic and immunity enhancer effect as reported by **Verma *et al.,* 2009) and (Mayo *et al.,* 2012)** or by Maringa leaves powder was having 9.15% crude fibre. Increase in fiber may also be responsible for less absorption of triglycerides and cholesterol from the intestinal tract of the birds. And increasing of total protein and globulin indicate to that moringa enhance immune states of birds due to total protein postulation reflect to metabolic activity of protein synthesis and degradation and cortisone secretion which increase during heat stress lead to increase in protein catabolism due to gluconeogenesis may be due to a high content of antioxidant which increase total protein by decreasing cortisone secretion which limit protein catabolism as reported by **(Hassan *et al.,* 2016)** this finding is confirmed by **(Dey and De 2013)** who found that 0.25 or 0.40 % MOLM in broiler diets was significant ($P< 0.01$) reduced in total cholesterol, triglyceride,LDL-cholesterol and increase in HDL-cholesterol in MOL supplemented birds also this results is compatible with **(Divya *et al.,* 2014)** who reported that,the dietary inclusion of MOL powder up to 1.5%, in broiler ration significantly ($P<0.05$) decreased triglycerides, cholesterol, albumin and reduced ALT and AST activities and with agree with **(Kout Elkloub *et al.,* 2015)** who mentioned that Plasma AST and ALT decreased with all levels of MOLM (0.2, 0.4 and 0.6%) and could suggest that MOLM has properties to enhance liver health. Plasma cholesterol had lower level in all treatments compared to control. In addition, HDL fraction was increased and LDL fraction was decreased in all treatments compared to control group and found Total protein and globulin were increased with all levels of MOLM compared to control group might be an indication of the good protein content and/or quality of the leaf meal. While A/G ratio in all dietary treatments appeared to be decreased. In

conclusion, dietary fortifications with Moringa oleifera at rate 0.5% or 1% to broiler diet have a positive impact on growth performance and blood constituent.

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Table (1): Physical and chemical composition of the basal diet.

Feed ingredient %	Starter	Grower	Finisher
Yellow corn	55.6	60.8	62.9
SBM 44%(Soy bean bean)	33.3	27.8	24.4
CGM 60% (corn gluten meal)	3	3.2	4.2
Methionine	0.24	0.24	0.2
Lysine	0.18	0.24	0.16
Soya oil	3.63	3.81	4.32
MCP (Mono calcium phosphate)	1.64	1.55	1.48
Lime stone	1.66	1.61	1.59
Sodium Chloride	0.35	0.35	0.35
*Premix	0.3	0.3	0.3
Toxin binder	0.1	0.1	0.1
Total	100.00	100.00	100.00
Chemical and Calculated analysis			
ME(Kcal/kg)	3033	3108	3180
Crude protein%	21.5	19.5	18.7
Crude fat%	2.65	2.70	2.77
Crude fiber%	3.02	2.94	2.80
Calcium%	1	1	1
Non-phytate phosphorus%	0.50	0.48	0.45

***per Kg premix: 1200000 IU vit A, 350000 IU vit.D3, 4000 mg vit. E, 250 mg vit.B1, 800 mg vit. B2, 600 mg vit. B6, 3.2 mg vit. B12, 450 mg vit. K3, 4.5 g nicotinic acid, 1.5 g Ca pantothenate, 120 mg folic acid, 5 mg biotin, 55 g choline chloride, 3 g Fe, 2 g Cu, 10 g Mn, 8g Zn, 120 mg I, 40mg Co .**

Table (2): Growth performance of broiler chickens fed diets fortified with Moringa Oleifera leaves (MOLM) during experimental period.

Item	Control	0.5% MOLM	1% MOLM
Initial body weight	**38.38 ± 0.18 [a]**	**38.58± 0.083 [a]**	**38.17 ± 0.46[a]**
Final body weight	**1906.42 ± 24.9 [b]**	**1919.25 ± 20.37 [b]**	**2001.83 ±20.97 [a]**
Total body gain	**1868.03 ± 21.03 [b]**	**1880.67 ± 28.62 [b]**	**1963.67 ± 14.83 [a]**
Total feed consumed (g)/bird	**3536.94 ± 64.70 [a]**	**3263.05 ± 28.89 [b]**	**3522.49 ± 36.4 [a]**
Overall FCR	**1.89 ± 0.04 [a]**	**1.74 ± 0.02 [b]**	**1.79 ± 0.021 [b]**

1-Values are means ±SE.

2-Values in the same row with different superscripts are significantly different at P ≤0.05.

Table (3): Blood serum biochemical parameters of broiler chickens fed diets fortified with Moringa oleifera leaves (MOLM) during experimental period.

Parameter	Control	0.5% MOLM leaves	1% MOLM leaves
ALT	**101.31 ±4.21 [a]**	**92.91 ± 3.49 [ab]**	**79.48 ±4.53 [b]**
AST	**14.22 ±1.84 [a]**	**12.83 ± 2.47 [ab]**	**7.17 ± 0.92 [b]**
Uric acid	**7.67 ± 0.45 [a]**	**7.14 ± 1.22 [a]**	**7.96 ± 0.45 [a]**
Creatinine	**1.02 ± 0.03 [a]**	**0.76 ± 0.26 [a]**	**0.79 ±0.12 [a]**
Total cholesterol	**141.83 ± 1.89 [a]**	**111.27 ± 10.3 [b]**	**110.89 ±8.50 [b]**
Triglycerides	**65.28 ± 2.60[a]**	**35.21± 8.08 [b]**	**35.81 ±9.74 [b]**
HDL	**49.11 ± 13.56 [b]**	**64.32 ± 1.13 [ab]**	**86.03 ±9.90 [a]**
LDL	**79.47 ± 3.29 [a]**	**48.85 ± 10.07 [b]**	**49.83 ±6.88 [b]**
VLDL	**11.79 ± 1.82 [a]**	**12.90 ±2.88 [a]**	**12.36 ±1.01 [a]**
Total protein	**0.43 ± 0.08 [b]**	**1.05 ±0.22 [a]**	**1.10 ± 0.063 [a]**
Albumin	**0.35 ± 0.08 [a]**	**0.58 ± 0.12 [a]**	**0.41 ± 0.05 [a]**
Globulin	**0.08± 0.02 [b]**	**0.47 ± 0.19[ab]**	**0.69 ± 0.11 [a]**

1-Values are means ±SE.

2-Values in the same row with different superscripts are significantly different at P ≤0.05.