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Research Article

Effect of Different Levels of *Moringa oleifera* Leaves on Productive Performance, Carcass Characteristics and Digestibility of broiler chicks

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Abstract

This study was carried out to study the effect of using different levels of *Moringa oleifera* leaves powder (MOLP) in growing Sasso chicks diet as feed additives on performance, carcass characteristics, digestibility of nutrients and economically efficiency. A total number of one hundred and fifty one day old, unsexed of Sasso broiler chicks were distributed into five treatment groups. Each group contain three replicates of 10 birds, each. The first group was fed control diet (without no addition). Whereas, 2nd, 3rd, 4th and 5th groups were fed diets contain grade levels of 0.1, 0.2, 0.3 and 0.4% MOLP respectively as feed supplementation. The obtain results showed that, birds fed diets supplemented with 0.1 and 0.2% MOLP recorded the best ($p<0.01$) values of body weight, weight gain, feed conversion, carcass weight, dressing percentage and the digestibility of crude protein compared with birds either fed control or 0.3 and 0.4% MOLP diets. No significant effects ($p>0.05$) were detected in weights of liver, gizzard, heart, abdominal fat and giblets or its proportions as a percent of carcass weight. Moreover, the digestibility of dry matter (DM), organic matter (OM), crude fiber(CF), ether extract (EE) and nitrogen free extract (NFE) had no effect ($P>0.05$) as a result of adding MOLP to Sasso broiler diets. Adding MOLP to broiler Sasso diets at levels of 0.1% and 0.2% improved ($p<0.01$) the economical efficiency compared with other dietary treatments. It could be concluded that, addition of *Moringa oleifera* leaves powder as feed supplementation up to 0.2% to growing Sasso diet improved performance as well as economic efficiency.

Keywords: Moringa Leaves; Sasso Broilers; Performance; Digestility; Carcass Traits

Introduction

Feed is a major component affecting net return from the poultry enterprise. Various strategies like feed supplements and additives are being used to ensure more net return and to minimize expenditure on feed [1]. Phytobiotic are plant derived feed additives [2] with biologically active substances and antimicrobial properties [3]. *Moringa oleifera* is the best known of 14 species of Moringa tree (family Moringaceae). It is a fast-growing, drought-resistant tree native to sub-Himalayan tracts of northern India, Pakistan, Bangladesh and Afghanistan. It is now growing worldwide in the tropics and subtropics [4]. *Moringa oleifera* leaves contains very high antioxidants and anti-inflammatory compounds [5]. In addition, moringa leaves, flowers and Pods are used as good sources of vitamins A, B and C, riboflavin, nicotinic acid, folic acid, pyridoxine, ascorbic acid, beta-carotene, calcium, iron, and alpha-tocopherol [6]. Moreover, Moyo., *et al*. [7] speculated that MOLP contains phytochemicals such as caffeic acid. Caffeic acid inhibits the development of osteoclasts, and natural anti-oxidants decrease lipid oxidation in meat. Mahfuz., *et al*. [8] reported that poultry scientists are now dedicated to applying unconventional natural feed supplement, which may play a role in possible therapies to improve the health as well as production performance of chickens. Thus, poultry researchers are searching for potential natural feed resources that will be both environmentally friendly and safe for human so-

ciety Pourhossein, Z., *et al*. [9] and Mahfuz., *et al*. [10]. The main purpose of this study was carried out to evaluated the effect of different levels (0.1, 0.2, 0.3 and 0.4%) of *Moringa oleifera* leaves powder as feed supplementation in Sasso broiler diets on productive performance, carcass characteristics, digestibility of nutrients and economic efficiency.

Materials and Methods

Experimental chicks and housing

This study was carried out in Animal and Poultry Production farm, Faculty of Agriculture, Minia University, Minia, Egypt to evaluate the effect of grade levels of MOLP in growing Sasso chick diet on productive performance, carcass characteristics, digestibility of nutrients and economic efficiency.

Birds and management

A total number of one hundred fifty unsexed, one day old Sasso broiler chicks was used in this study. Chicks were randomly distributed in cages and housed in two-tiers floor batteries located in an open house under similar managerial conditions. Artificial lighting was provided 24 hours daily during the whole experimental period (0-8 weeks of age). The temperature in brooding house was about 36°C for the first 3 days of age, after that it was reduced 2 degrees every week until 4th week of age. Then, the temperature was kept at 25°C till the end of experimental period. Free access water and feed were available all time. The chicks were divided into 5 groups, 30 birds each. Each group contained 3 replicates of 10 birds.

Experimental diets

Birds were distributed into five treatment groups. The first treatment group was fed on a commercial diet with no additions. The other four experimental diets were obtained by incorporating four levels (0.1, 0.2, 0.3 and 0.4%) of MOLP as feed supplementation into the broilers commercial diet. The sequence of the 5 dietary treatments were as follow:- Control (with no additions), control supplemented with 0.1% MOLP, control supplemented with 0.2% MOLP, control supplemented with 0.3% MOLP and control supplemented with 0.4% MOLP. All birds fed either commercial diet with or without MOLP additions from 0 to 8 weeks of age. The proximate analysis of commercial diet is shown in table 1.

Nutrient	%
Crude protein	20
Crude fiber	3.50
Ether extract	3.85
Metabolizable energy. kl cal/kg diet	2950

Table 1: The proximate analysis commercial diet.

Preparation of *Moringa oleifera* leaf powder

Fresh and green *Moringa oleifera* leaves were collected from moringa trees planted in Farm of Horticulture Department, Faculty of Agricultural, Mnia University. The leaves were air-dried in shadow place for one week. Then, leaves were collected and grinded to a fine powder and kept at room temperature until requested. Sample of grinded leaves was taken for proximate analysis as shown in table 2.

Nutrient	%
Dry matter	92.68
Crude protein	21.91
Crude fiber	10.95
Ether extract	5.63
Ash	15.21
Nitrogen free extract	46.30

Table 2: The proximate analysis of dried moringa olifera leaves powder.

Performance measurements

The live body weight of each replicate recorded to the nearest gram each two weeks through the experimental periods from 0 to 8 weeks of age. Feed intake and body weight gain of the bird were calculated (g/bird) during the periods 0 to 2, 2 to 4, 4 to 6, 6 to 8 and 0 to 8 weeks of age. Feed conversion ratio was calculated as the amount of feed required for producing a unit of body weight gain (g, feed/g, gain) during the previous feed consumption and body weight gain periods.

Carcass traits

At the end of the experiment (8 weeks of age), representative samples of birds (3 birds from each treatment) around average treatment body weight mean then individually weighed. All birds were slaughtered and after complete bleeding, the birds were scalded and feathers were plucked. Carcasses were eviscerated,

heads and shanks were separated, then the carcass were chilled in tap water for about 10 minutes. Eviscerated carcasses were individually weighed and dressing percentage was calculated (weight of carcass × 100/perslaughter weight). Percentage of giblets (liver + gizzard + heart) and offal's were calculated in relation to carcass weight.

Digestibility trial

At the beginning of the 9th week of age, Birds were fed on the same diets used during period which means no need for a preliminary period. So, the collection period directly for 3 days. Feed intake was determined and feces output was collected daily, scattered feed and feather were separated and taken out of the feces. Samples of the tested diets and collected feces for each treatment were pooled together, dried at 60º C till constant weight, ground in a mill and then kept in glass cans for chemical analysis. Digestion coefficient was calculated as follow:

$$\text{Digestibility (\%)} = \frac{\text{(Nutrient in feed x FI) – (Nutrient in faeces x FO) x 100}}{\text{Nutrient in feed x FI}}$$

Where: FI = Feed intake, FO = fecal Output.

Chemical analysis of the experimental diets and excreta were undertaken according to the official methods of A.O.A.C [11]. Fecal nitrogen was determined according to Jakobsen., *et al* [12].

Economic efficiency

Economical efficiency of dietary treatments were estimated at the end of period as described by Bayoumi [13] as net revenue per unit of feed cost. Cost of one kilogram feed for different diets, the cost of feed/ kg gain, and the cost of feed/ birds were calculated based on the prices of feed and one kilogram of live body weight prevailing in local market at the time of experimental. The relative economic efficiency was estimated as follow:

Total revenue(TR)= final live body weight (FLBW)× market price of one kg of LBW

Net revenue (NR)= total revenue- total feed cost(TFC)

Whereas, TFC= total feed intake × price of feed

Economic efficiency (EE)= NR\TFC

Relative economic efficiency (REE)= (EE for treatment group\ EE for control group)× 100

Statistical analysis

Data were summarized using Microsoft® Excel 2010 (10.2614.2625) Microsoft Egypt, mssupport@gbrands.com. Then, data were statistically analyzed by the analysis of variance using the General Linear Model (GLM) procedure of Statistical Analysis System [14]. Significant differences among treatments were separated by Duncan's multiple range tests Duncan [15].

Results and Discussions

Chemical composition of *Moringa oleifera* leaves powder

The chemical composition of MOLP is presented in (Table 2). The data revealed that, MOLP contain 92.68, 21.91, 10.95, 5.63, 15.21 and 46.30 of dry matter, crude protein, crude fiber, ether extract, ash and nitrogen free extract as respectively. This result indicate that MOLP contain high level of crud protein and low level of ether extract and this is confirmed by the result of Gupta., *et al*. [16] who reported values for crude protein, crude lipids and ash were 26.4, 6.5 and 12%, respectively. In addition, Kakengi., *et al*. [17] found that *Moringa oleifera* leaves meal contained 86% DM, 29.7l% crude protein, 22.5% crude fiber, 4.38% ether extract, 27.9% calcium and 0.26% phosphorus. Similarly, Oduro., *et al*. [18] revealed that MOLP contain of crude protein 27.51%, crude fiber 19.25%, crude fat 2.2.3%, Ash 7.13%, carbohydrate 43.88% and calorific value of 305.62. However, Nuhu [19] reported values of crude protein, ether extract, crude fiber, and ash to be 29.55, 2.2.3, 19.5 and 7.13%, respectively. The variation in all these values by different authors would be due to agro-climatic conditions and maturity of the plant during the harvest [20].

Live body weight and body weight gain

Average live body weight and body weight gain as affected by adding different levels of MOLP to growing Sasso chicks diet presented in (Table 3). The data showed that, adding 0.1% MOLP supplementation to broiler diet recorded the greatest ($p<0.05$ or $p<0.01$) live body weight (LBW) and body weight gain during all experimental periods except at 2 weeks of age for body weight and the periods from 0 to 2 or 2 to 4 weeks of age for body gain compared with other dietary treatments. At the end of experiment (8 weeks of age), birds fed the highest level (0.4%) MOLP presented the lowest ($p<0.01$) value of LBW and BWG followed by birds fed dietary 0.3% MOLP compared with other treatments and control diet.

The improvement in live body weight and body weight gain of broilers fed dietary 0.1% MOLP compared with birds fed control diet may be due to the antimicrobial abilities which found in *Moringa oleifera* leaves [21] and pharmacological properties [22]. It also contents sufficient quantities of carotene, ascorbic acid, iron, methionine and cysteine which my enhance performance of birds [23]. In addition, Yang., *et al*. [5] reported that Moringa is a potential plant that could be used to enhance immune response and to improve intestinal health of broiler chicken. The previous result was harmony with the finding of [1,24,25] who observed that the higher significant values of live body weight and body gain are recorded at low and moderate levels (0.2 and 0.4) of MOLP and worst value was high level (0.6) of MOLP compared with control. Moreover, Divya., *et al*. [26] reported that addition of Moringa leaves at 0.5%, 1.0%, 1.5% and 2.0% level or antibiotic did not improvement in body weight. Jayanti., *et al*. [1] who revealed that live body weight and body weight gain differed significantly ($p<0.01$) among various treatment groups. The birds fed 0.2% MOLP recorded significantly higher mean weight gain compared to control and other treatment groups.

On the other hand, Ramadan [27], stated that body weight gain was significantly higher in all *Moringa oleifera* leaf meal (MOLM) treated groups (0.3, 0.5 and 0.8%) compared to control birds.

Items	Age\ weeks	Treatments MOLP levels (%)					SE	Sig.
		0.0%	0.1%	0.2%	0.3%	0.4%		
LBW	0	42.0	45.0	44.6	43.0	44.3	±1.60	NS
	2	209.2	230.3	216.0	213.0	208.3	±8.06	NS
	4	650.5^{b}	712.3^{a}	675.3^{ab}	643.3^{b}	624.0^{b}	±17.62	*
	6	1341.4^{b}	1426.4^{a}	1347.8^{b}	1312.67^{b}	1279.7^{b}	±18.62	**
	8	2090.8^{b}	2306.0^{a}	2111.2^{b}	2028.3^{bc}	1947^{c}	±40.68	**
BWG	0-2	167.3	185.3	171.4	170.0	164.6	±1.60	NS
	2-4	41.2	482.0	459.6	430.3	415.7	±8.06	NS
	4-6	691.0^{ab}	714.1^{a}	671.3^{cb}	669.3^{cb}	640.7^{c}	±17.62	*
	6-8	740.3^{bc}	869.6^{a}	764.3^{b}	715.0^{bc}	657.7^{c}	±18.62	**
	0-8	2048.8^{b}	2262.0^{a}	2066.6^{b}	1985.3^{bc}	1902.7^{c}	±40.68	**

Table 3: Effect of dietary *moringa olifera* leaves powder (MOLP) on live body weight (LBW) and body weight gain (BWG) of Sasso broiler chicks.

$^{a, b \text{ and } c}$ means in the same rows for each treatment having different letter (s) are significantly different ($p<0.05$) NS: Not Significant ($p>0.05$); *: Significant ($p<0.05$); **: High Significant ($p<0.01$).

Feed intake and feed conversion ratio

Average feed intake as affected by addition of different levels MOLP are presented in (Table 4). The data showed that there are no significant ($p>0.05$) differences between dietary treatments in feed intake except from 0-2 weeks of age. Birds fed dietary 0.1% MOLP or 0.2% MOLP and control diet presented slightly improvement in feed intake compared with other levels of MOLP (0.3 or 0.4%).

As a result of the significant improvement in body gain (Table 3) without the same improvement in feed intake of birds fed 0.1% MOLP, these birds offered the best feed conversion ratio during all periods compared with other MOLP supplementation levels and control diet (Table 4). The lowest feed conversion efficiency was recorded for birds fed diets contain the higher levels of MOLP (0.3 and 0.4%).

The previous results of feed intake and feed conversion are in the line of, Juniar., *et al*. [28] who found no differences in feed consumption between birds fed 2.5, 5, 7.5 and 10% *Moringa oleifera* leaf Flour (MOLF) compared to control birds.

On the other hand, Kout., *et al*. [25] who observed that different levels of *Moringa oleifera* leaf meal in japanese quail diets (0.0, 0.2, 0.4 and 0.6%) showed lowest feed consumption at 0.2% *Moringa oleifera* leaf meal compared to other groups and best feed conversion ratio in birds fed on 0.2% MOLM. Divya., *et al*. [26] observed that addition of Moringa leaves at this 0.5%, 1.0%, 1.5% and 2.0% levels or antibiotic did not result in significantly change in feed intake on 21 and 42 days of age. Shad and Xiang [29] found that feed intake was highest in birds on positive control (having antibiotics) and lowest in birds that consumed 90 mL/liter of leaf extracts. Hassan., *et al*. [30] showed that feed intake was increased significantly ($p<0.05$) as the level of MOLM increase when fed birds on commercial diet supplemented with MOLP at (0, 0.1, 0.2, 0.3%). Also, Paguia., *et al*. [31] studied the influence of *Moringa oleifera* leaf meal basal diet (control), 0.1%, 0.2%, 0.3%, 0.4% on growth performance of Cobb broiler chicks from (from 0 to 35 days) of age and was found to have no effect on average cumulative feed consumption. Jayanti., *et al*. [1] found that, the best weekly feed conversion ratio (FCR) was obtained by using 0.2% *Moringa oleifera* leaf powder in all periods compared to control and other treatment. However, Gehad [32] revealed that, there was no significant difference ($P\geq0.05$) between dietary treatments in feed conversion during all experimental periods except the period from 2 to 4 weeks of age. Hassan., *et al*. [30] showed that feed conversion ratio was recorded better values as the level of MOLM increase.

On the other hand, Gehad [32] who reported that, there was a significant difference ($P\leq0.05$) between dietary treatments in feed consumption during all experimental periods except the first interval (0 to 2) weeks of age. During the entire period of the experiment (0 to 6 weeks of age), the greatest ($P\leq0.05$) feed consumption was recorded for birds fed 0.2% diets containing Moringa oliefera leaves meal followed by birds fed dietary 0.4% Moringa oliefera leaves meal compared with other dietary treatments (control or 0.6% MOLM).

Items	Age\ weeks	Treatments MOLP levels (%)					SE	Sig.
		0.0%	0.1%	0.2%	0.3%	0.4%		
FI	0-2	325.0^{a}	303.0^{ab}	288.0^{b}	303.0^{ab}	310.0^{ab}	±6.28	*
	2-4	876.0	865.0	841.0	827.0	828.0	±12.16	NS
	4-6	1498	1393	1396	1347	1359	±28.51	NS
	6-8	1826	1983	1925	1893	1804	±69.5	NS
	0-8	4526	4543	4443	4367	4302	±88.57	NS
FCR	0-2	1.91^{a}	1.57^{c}	1.64^{c}	1.72^{abc}	1.82^{ab}	±0.072	*
	2-4	2.01	1.79	1.82	1.93	2.00	±0.064	NS
	4-6	2.17	1.92	2.08	2.12	2.07	±0.061	NS
	6-8	2.43^{b}	2.23^{c}	2.50^{ab}	2.62^{ab}	2.68^{a}	±0.062	**
	0-8	2.20^{ab}	1.98^{c}	2.14^{b}	2.19^{ab}	2.26^{a}	±0.030	**

Table 4: Effect of dietary of *Moringa olifera* leaves powder (MOLP) on feed intake (FI) and feed conversion ratio (FCR) of Sasso broiler chicks.

$^{a, b \text{ and } c}$ means in the same rows for each treatment having different letter(s) are significantly different ($p<0.05$). NS: Not Significant ($P\leq0.05$); *: Significant ($P\leq0.05$); **: High significant ($P\leq0.01$).

Carcass characteristics

The effect of dietary MOLP levels on the absolute and proportion of some carcass characteristics for Sasso broiler diet shown in (Table 6). The data showed there are no significant ($P\geq0.05$) differences between dietary treatments as a result of that adding MOLP to broiler diets. The greatest ($p<0.05$) carcass weight and dressing percentage was recorded for birds fed (0.1%) MOLP followed by birds fed (0. 2%) MOLP compared with other dietary treatments. The improvement of dressing percentage as a result of adding MOLP supplementation for Sasso broiler at a levels of 0.1 or 0.2% may be due to the improvement of body weight and body gain for these birds (Table 4). Moreover, this enhancement could be due

to that moringa contain vital nutrients such as antioxidants and anti-inflammatory compounds [5]. In addition, moringa leaves, are used as good sources of vitamins A, B and C, riboflavin, nicotinic acid, folic acid, pyridoxine, ascorbic acid, beta-carotene, calcium, iron, and alpha-tocopherol [6].

Hassan., *et al*. [30] found that the levels of MOLM had no significant effect on carcass relative weight, liver, gizzard, heart and abdominal fat. Moreover, El-Badawi., *et al*. [33] found that supplementation of *Moringa oleifera* dry leaves of growing rabbits diets at 0.15 or 0.30% of the daily ration improved carcass traits. Nkukwana., *et al*. [34] found that addition of MOLM (0.1-2.5%) to broiler diets have no significant effects on carcass weight, dressing percentage and the relative weights of the liver, gizzard and heart. Also, Ayssiwede., *et al*. [35] reported that inclusion of MOLM had no significant effect on the dressing percentage of indigenous chicken. In addition, Gehad [32] showed that no significant differences (P>0.05) on carcass, giblets and offal weights as a result of adding *Moringa oleifera* leaf meal (MOLM) to growing Japanese quail diet at all levels 0.2, 0.4 and 0.6%.

Items (%)	Treatments MOLP levels (%).					SE	Sig.
	0.0%	0.1%	0.2%	0.3%	0.4%		
Dry matter	76.15	78.39	75.08	74.34	74.61	±1.93	NS
Organic matter	73.46	77.73	73.95	74.10	73.20	±1.90	NS
Crude protein	75.38^{ab}	77.04^{a}	74.21^{bc}	72.14^{c}	75.39^{ab}	±0.72	**
Crude fiber	33.27	35.89	35.83	33.87	33.34	±2.76	NS
Ether extract	83.05	83.90	81.74	80.17	80.80	±1.79	NS
Nitrogen free extract	75.59	77.61	77.83	76.30	75.83	±1.17	NS

Table 5: Effect of dietary of *Moringa olifera* leaves powder (MOLP) on nutrients digestibility.

$^{a,b\ and\ c}$ means in the same rows for each treatment having different letter(s) are significantly different (p<0.05). NS: Not Significant (P≤0.05); *: Significant (P≤0.05); **: High Significant (P≤0.01).

Items (%)	Treatments MOLP levels (%)					SE	Sig.
	0.0%	0.1%	0.2%	0.3%	0.4%		
LBW, g	2213.8^{ab}	2436.6^{a}	2087.3^{ab}	1940.8^{b}	2196.9^{ab}	±129.3	**
Carcass. g	1513.2^{ab}	1706.7^{a}	1451.4^{ab}	1298.0^{b}	1481.6^{ab}	±91.52	*
Dressing	68.3^{b}	71.6^{a}	69.5^{ab}	67.3^{b}	67.4^{b}	±0.88	*
Liver	3.55	3.63	3.63	3.71	3.89	±0.28	NS
Gizzard	1.87	2.44	2.88	2.54	2.13	±0.29	NS
Heart	0.88	1.16	1.34	1.30	0.92	±0.16	NS
Abdominal fat	1.68	1.59	2.06	2.46	1.78	±0.34	NS
Giblets	7.89	8.90	9.77	9.82	8.71	±0.82	NS

Table 6: Effect of dietary of *Moringa olifera* leaves powder (MOLP) on carcass characteristics.

$^{a,\ b\ and\ c}$ means in the same rows for each treatment having different letter(s) are significantly different (p<0.05). NS: Not Significant (P≤0.05); *: Significant (P≤0.05); **: High Significant (P≤0.01).

Digestibility trail

Average of nutrients digestibility as affected by addition of different levels MOLP are presented in (Table 5). The data showed that broiler chicks were fed on commercial diet supplemented with different levels of MOLP recorded highly significant differences ($p<0.01$) in the digestibility of crude protein (CP). The greatest value of crud protein digestion coefficient recorded for birds fed 0.1% MOLP compared with other dietary treatment groups. However, birds fed all grade levels of MOLP in their diet had no significant ($p>0.05$) in other nutrients such as dry matter (DM), organic matter (OM), crude fiber (CF), ether extract (EE) and nitrogen free extract (NFE). The improvement in crud protein digestibility for the birds fed dietary moringa may confirmed the results of live body weight and body weight gain (Table 4). Also, this results was confirmed by the study of El-Badawi., *et al*. [33] who found that supplementation of *Moringa oleifera* dry leaves of growing rabbits diets at 0.15 or 0.30% of the daily ration improved protein utilization efficiency.

Nkukwana., *et al*. [34] found that There were no significant differences in apparent digestibility for ash, ether extract, crude fiber and crude protein. Also, Gehad., [32] revealed that there were no significant differences between dietary treatments in the digestibility coefficients for all nutrients of the diets when Japanese quail was fed on dietary MOLM at 0.2, 0.4 and 0.6%.

Economic efficiency

The effect of dietary treatments on total feed cost, total revenue, net revenue, economic efficiency and relative economic efficiency are showed in (Table 7). The data revealed that there are high significant differences in total revenue, net revenue and relative economic efficiency for birds fed 0.1% compared with other dietary treatments. Whereas, total feed cost had no significant differences when MOLP was added to commercial diet at all levels. Jayanti., *et al*. [1] reported that birds fed 0.2% recorded high profit followed by birds fed *Moringa oleifera* leaf powder at 0.4%, 0.6% and control.

In contrast, Onunkwo and George [36] and Shad and Xiang [29] no significant differences were observed on growth performance and economic parameters in broilers fed with *Moringa oleifera* leaf meal, in addition, Paguia., *et al*. [31] showed that the addition of Moringa leaf powder on broiler diets did not ($P>0.05$) significantly influence on feed cost per kg of broiler produced and Income over feed and chick cost.

Gehad, 2019 showed that as a result of increasing feed intake, cost of kg feed and feed cost/bird for birds fed dietary MOLM at all levels, the net revenue, economical efficiency and relative economical efficiency for birds fed dietary MOLM were decreased compared with control diet [37].

Items	Treatments MOLP levels(%)					SE	Sig.
	0.0%	0.1%	0.2%	0.3%	0.4%		
FLBW[1]	2090.8[a]	2306.0[b]	2111.2[b]	2028.3[bc]	1947.3[c]	±40.67	**
FI(0-8)[2]	4526.0	4543.7	4443.3	4367.3	4302.7	±88.57	NS
TFC[3]	28.06	28.71	28.12	28.65	28.74	±0.60	NS
TR[4]	52.25[b]	57.51[a]	52.78[b]	50.74[cb]	48.68[c]	±1.02	*
NR[5]	24.19[bc]	28.86[a]	24.65[b]	22.09[cd]	19.94[d]	±0.83	**
EE[6]	0.85[bc]	1.01[a]	0.88[b]	0.77[cd]	0.69[d]	±0.02	**
REE[7]	100.0[bc]	118.8[a]	103.2[b]	90.0[cd]	81.6[d]	±3.18	**

Table 7: Effect of dietary levels of *Moringa olifera* leaves powder (MOLP) on economic efficiency.

[a, b and c] means in the same rows for each treatment having different letter(s) are significantly different ($p<0.05$). NS: Not Significant ($P\leq0.05$); *: Significant ($P\leq0.05$); **: High Significant ($P\leq0.01$). Whereas; 1: Final Live Body Weight; 2: Feed Intake from 0 to 8 Weeks Of Age; 3: Total Feed Cost; 4: Total Revenue; 5: Net Revenue; 6: Economic Efficiency; 7: Relative Economic Efficiency.

Conclusion

It could be concluded that, adding of MOLP supplementation to broiler diets at levels of (0.1% and 0.2%) improved growth performance, Digestibility of some nutrients (crude protein), dressing percentage and economical efficiency of Sasso broiler chicks.

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