

Original Research Article

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Effect of Feeding *Moringa oleifera* Leaf Meal as Feed Additive on the Performance and Carcass Characteristics of Broiler Chicks

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ABSTRACT

Keywords

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A study was carried out to evaluate the effect of *Moringa oleifera* leaf meal (MOLM) as feed additive on the growth performance and carcass characteristics of broiler chicks. A total of 150 one day-old broiler chicks (Vencobb-400) were randomly assigned to five dietary treatments (T₁, T₂, T₃, T₄ and T₅) containing MOLM at 0, 0.5, 1.0, 1.5 and 2.0% inclusion levels respectively, in a complete randomized design experiment. The basal diet was formulated according to the BIS recommendations and used for the starter and finisher. The obtained results showed that dietary supplementation with different levels of moringa significantly improved the performance of broiler chicks and positively affected nutrient metabolizability, percentages of carcass yield, total edible parts and weights of giblets compared with their control counterparts. Results revealed that, effect of moringa leaf meal supplementation on average final body weight, average daily gain, average daily feed intake and feed conversion ratio were significant (P<0.01). Birds fed on 1.5% MOLM diet showed heaviest body weight, with the best feed conversion ratio. It was concluded that supplementation of MOLM at 1.5% level of diet was effective in improving the performance of broiler chickens.

Introduction

The global population is steadily increasing and is projected to include approximately 9.6 billion peoples by 2050. In addition, poultry production has increased during the last few years and in 2020 the OECD (FAO) was predicted to produce around 130 million tons of chicken meat to match the demand of a growing world population. Nowadays, the poultry industry is recognized as a fast

growing component of the agricultural sector, which provides protein-rich food at affordable rates. However, this sector has drawn more attention towards environmental and food safety since animals including poultry gut microbes can be the source of bacterial pathogens such as *Salmonella* and *Campylobacter* which can disseminate to humans or act as a pool for antibiotic resistance and transmission and therefore may pose a serious threat to public health (Kumar

et al., 2018). These gut microbes compete with the host for energy and protein. In both the proximal and distal gut, microbes produce toxic metabolites (e.g., amino acid catabolites) and catabolize bile acids, which may depress growth and decrease fat digestibility of the birds, respectively (Gaskins *et al.*, 2002). Due to drug resistance problems associated with antibiotic use and increasing consumers demand for antibiotic residue-free products, most researchers are looking for a natural alternatives (herbal feed additives) to antibiotic growth promoters.

Moringa oleifera (drumstick) is one of the plants that can be used in the preparation of poultry feed. The plant in addition to being a good source of vitamins and amino acids, it has wide range of medicinal value including growth promotion and antimicrobial effect (Mbikay, 2012 and Moyo *et al.*, 2011). Siddhuraju and Becker (2003) reported that moringa leaves have potential prebiotic effects and potentially antioxidant phytochemicals, such as chlorogenic acid and caffeic acid. *Moringa oleifera* leaf meal, widely available in many tropical countries, is also a good source of antioxidant compounds such as ascorbic acid, flavonoids, phenolics and carotenoids (Teixeira *et al.*, 2014). *Moringa oleifera* leaves contained crude protein 27.51%, crude fiber 19.25%, crude fat 2.23%, ash 7.13%, moisture 76.53%, carbohydrates 43.88% and calorific value 1296 kJ/100g.

The calcium and iron levels were 20.09 and 28.29 mg/100g (DM), respectively (Oduro *et al.*, 2008). Additionally, *Moringa oleifera* leaves have high protein content (20-35% of DM) with high levels of all the essential amino acids (Foidl and Paul, 2008).

Therefore, the present study was carried out to evaluate the effect of *Moringa oleifera* leaf meal (MOLM) as feed additive on the growth

performance and carcass characteristics of broiler chicks.

Materials and Methods

One hundred and fifty, one-day old unsexed (Vencobb-400) broiler chicks were randomly distributed into 5 groups of 30 chicks. Each group was further subdivided into 3 replicates with 10 chicks per each. Five levels of *Moringa oleifera* leaf meal (MOLM) 0.0, 0.5, 1.0, 1.5 and 2% (treatments T₁, T₂, T₃, T₄ and T₅) were fed during the experimental period for 42 days duration. All the experimental diets were to meet the nutrient requirements of broiler chicks according to BIS (1992) which were procured from Godrej Agrovet Limited. Good quality *Moringa oleifera* leaf meal (MOLM) powder was procured from Sinhal Herbs, Neemuch, M.P. The chemical compositions of broiler starter, broiler finisher and MOLM were analysed according to the standard methods of analysis (AOAC, 2016) which is shown in Table 1. The chemical composition of experimental feed offered to broiler chicks in different treatment groups during feeding trial is shown in Table 2. Feed and water were supplied *ad - libitum*, and uniform light was provided 24hr daily. The performance of broiler chicks was recorded weekly in terms of feed intake, live weight gain and feed conversion ratio. At the end of the experiment the chicks were weighed individually after overnight fasting (except water), then slaughtered by severing the jugular vein without stunning and 5 minutes bleeding time was allowed for each bird. The dressed weight was expressed as percentage of live weight. The giblets (heart, liver and gizzard) were cleaned and retained along with the carcass to record eviscerated weight and expressed as percentage of pre-slaughter weight.

Statistical analyses were made by analysis of variance (ANOVA) for a completely

randomized design, according to (Snedecor and Cochran, 1989) and means were tested for significant differences as per Duncan's multiple range test (Duncan, 1955).

Results and Discussion

Performance of broiler chicks fed on different levels of *Moringa oleifera* leaf meal (MOLM) is shown in Table 3. Body weight gain, feed intake, feed conversion ratio (FCR) and performance index (PI) were improved significantly ($P<0.01$) with the supplementation of moringa leaf meal in the broiler's diet. The diet supplemented with 1.5% MOLM showed significantly heaviest body weight gain with better feed conversion ratio and performance index. The improvement in weight of birds fed on a moringa supplemented diet may be attributed to the high protein content of the diet, which was efficiently metabolized for growth. This result was in accordance with the finding of Tazi and Tibin (2014) and Ayo-Ajasa *et al.*, (2016), who reported significantly higher weight gain of birds fed diets with MOLM as compared to the control. The total feed

consumption was decreased significantly ($P<0.01$) with the increasing level of MOLM. This reduction could be due to reduced palatability of the diet (Kakengi *et al.*, 2003). The results coincided with the finding of Abu *et al.*, (2020) and Mikhail *et al.*, (2020) who reported significant decrease in feed intake as the inclusion rate of MOLM in the broilers diet increased. The FCR and PI were significantly ($P<0.01$) improved of the birds fed on MOLM based diets as compared to control group. These results were similar to the findings of Abu *et al.*, (2020) who reported that feed conversion ratio and performance index of birds were improved as level of MOLM increased in the diet of birds. Contrary to this, Aderinola *et al.*, (2013) reported significant increase in the feed conversion ratio of the birds fed MOLM based diets than birds that are fed without MOLM. This improvement in body weight gain and feed conversion ratio may be attributed to rich content of nutrients in MOLM (Kakengi *et al.*, 2003) and antimicrobial properties of Moringa (Fahey *et al.*, 2001).

Table.1 Chemical composition of broiler starter, broiler finisher and MOLM (%DM basis)

S. No.	Chemical composition	Broiler starter	Broiler finisher	MOLM
1.	Dry matter	91.20	91.51	94.32
2.	Crude protein	21.36	20.24	24.56
3.	Ether extract	4.13	4.56	7.10
4.	Crude fibre	3.70	3.70	7.82
5.	Total ash	6.75	6.70	9.20
6.	Nitrogen free extract	64.06	64.80	51.32
7.	Acid insoluble ash	1.25	1.35	0.51
8.	NDF	9.90	10.11	11.30
9.	ADF	3.33	3.53	8.39
10.	Calcium	1.16	0.88	1.58
11.	Phosphorus	1.18	0.93	0.30
12.	ME (Kcal/kg of feed)	2950	3100	-
13.	E/P ratio	138.11:1	153.16:1	-

Table.2 The chemical composition of experimental feed offered during feeding trial to broiler chicks (% DM basis)

Parameters	Treatment groups				
	T ₁	T ₂	T ₃	T ₄	T ₅
Broiler starter					
DM	91.20	91.23	91.21	91.20	91.20
CP	21.36	21.38	21.40	21.42	21.44
EE	4.13	4.17	4.21	4.25	4.29
CF	3.70	3.73	3.76	3.79	3.82
TA	6.75	6.75	6.77	6.79	6.79
AIA	1.25	1.25	1.25	1.25	1.24
NDF	9.90	9.93	9.95	9.98	9.99
ADF	3.33	3.37	3.41	3.43	3.47
Ca	1.16	1.16	1.16	1.17	1.18
P	1.18	1.18	1.18	1.17	1.17
Broiler finisher					
DM	91.51	91.52	91.52	91.50	91.53
CP	20.24	20.26	20.28	20.30	20.32
EE	4.56	4.61	4.65	4.69	4.74
CF	3.70	3.74	3.76	3.79	3.82
TA	6.70	6.70	6.72	6.72	6.73
AIA	1.35	1.35	1.35	1.35	1.34
NDF	10.11	10.13	10.15	10.18	10.19
ADF	3.53	3.54	3.57	3.59	3.60
Ca	0.88	0.88	0.88	0.89	0.90
P	0.93	0.93	0.93	0.92	0.92

Table.3 Performance of broiler chicks fed on different levels of *Moringa oleifera* leaf meal (MOLM)

Parameters	Treatment groups					SEM
	T ₁	T ₂	T ₃	T ₄	T ₅	
Initial live weight (g/chick)	42.20	42.51	42.39	42.26	42.51	0.056
Final live weight (g/chick)	1878.20 ^a	2035.33 ^b	2108.26 ^c	2170.97 ^d	2089.94 ^c	22.992
Body weight gain (g/chick)	1836.00 ^a	1992.82 ^b	2065.87 ^c	2128.70 ^d	2047.43 ^c	22.995
Total feed intake (g/chick)	3923.20 ^c	3770.25 ^{ab}	3785.18 ^{ab}	3746.00 ^{ab}	3704.89 ^a	17.282
Feed conversion ratio	2.03 ^d	1.84 ^c	1.75 ^b	1.72 ^{ab}	1.75 ^b	0.018
Performance index	906.14 ^a	1081.83 ^b	1180.16 ^c	1241.15 ^d	1172.79 ^c	22.887

Table.4 Effect of *Moringa oleifera* leaf meal on carcass evaluation parameters (% of live weight) and organs weight (g)

Parameters	Treatment groups					SEM
	T ₁	T ₂	T ₃	T ₄	T ₅	
Dressing yield (%)	72.45 ^a	73.50 ^b	73.89 ^{bc}	74.15 ^{bcde}	73.95 ^{bcd}	0.164
Eviscerated yield (%)	67.24 ^a	68.43 ^b	68.79 ^{bc}	69.00 ^{bcde}	68.95 ^{bcd}	0.169
Liver (g)	53.14 ^a	58.56 ^b	61.78 ^c	67.82 ^d	67.80 ^d	1.024
Heart (g)	10.23 ^a	10.75 ^b	11.24 ^d	11.10 ^c	11.46 ^e	0.106
Gizzard (g)	34.45 ^a	34.68 ^b	35.13 ^c	35.67 ^d	35.84 ^e	0.117
Giblet (g)	97.82 ^a	103.99 ^b	108.15 ^c	114.59 ^d	115.10 ^e	1.236

Effect of *Moringa oleifera* leaf meal on carcass evaluation parameters and organs weight is shown in Table 4. Broiler chicks fed on diets supplemented with MOLM showed highly significant ($P < 0.01$) effect on dressing yield and eviscerated yield. Highest dressing and eviscerated percentage were recorded to be 74.15 % and 69.00 % respectively in T₄ group containing 1.5 % MOLM and the lowest values were found in control group. These findings were in accordance to Ayo-Ajasa *et al.*, (2016), Tijani *et al.*, (2016) and Safa (2014) who reported that the addition of MOLM in the diets significantly ($P < 0.05$) increased the dressing and eviscerated weight percentage. However, Tesfaye *et al.*, (2013) reported that eviscerated yield was not affected by treatment ($P > 0.05$) of MOLM in broiler. Onunkwo and George (2015) reported that there was no significant difference in dressing percentage in all the dietary treatments of MOLM fed groups.

As shown in Table 4 there was highly significant ($P < 0.01$) effect on weight of liver, heart, gizzard and giblet due to supplementation of *Moringa oleifera* leaf meal as feed additive in broilers ration. Highest weight of heart, gizzard and giblet was recorded to be 11.46, 35.84 and 115.10 g respectively in T₅ group containing 2.0 % MOLM and highest liver weight was recorded to be 67.82 g in 1.5 % MOLM supplemented group. In congruence to results of present

study, Abousekken (2015) reported that the significantly ($P < 0.05$) higher values of organ weight (%) of gizzard, liver and heart of birds fed moringa leaves extracts. Aderinola *et al.*, (2013) observed significant effect of feeding MOLM on liver and gizzard weight. Voemesse *et al.*, (2018) observed that gizzard weight was significantly increased ($P < 0.05$) in chickens fed 0, 1 and 3% MOLM as compared to control. Contrary to this, Mikhail *et al.*, (2020) found non-significant effect on giblet, liver and gizzard weight of broilers fed MOLM at 0, 2.5, 5, and 7.5% level.

In conclusion these results suggested that *Moringa oleifera* leaf meal could be used as a feed additive for broilers to improve growth performance without adverse effects, with addition of 1.5 % in the diets.

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