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Research Article

Replacement of Sunflower Meal with *Moringa Oleifera* Leaves on Growth Performance of Broiler

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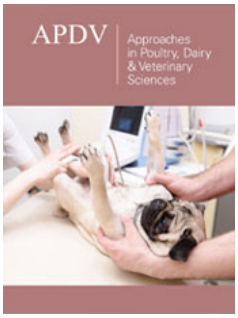

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Abstract

Moringa oleifera leave are the protein source with an adequate profile of amino acids. The present study was undertaken in order to determine the replacement of sunflower meal with *moringa oleifera* leaves on growth performance of broiler. Birds were arbitrarily separated in four groups, i.e. A (control) was offered 0% *Moringa oleifer* meal whereas; 1.25% (group B), 2.5% (group C) and 3.75% (group D) *Moringa oleifera* leaves meal. Parameters measured were weight gains, feed intake, dressing percentage and Feed conversion ratio calculated. Results showed that the maximum chicken body weight and feed intake was noted in group C, as compared to other groups. Feed intake was minimum in group A (control). The higher water intake was recorded in group C, followed by other groups. There was significant ($p<0.05$) difference in dressing percentage between those groups which have fed the *Moringa oleifera* leaf meal diet and control group. Feed conversion ratio was significantly ($p<0.05$) better in group C, followed by other groups the non-significantly variance founded respectively. Different organs parts, liver, Heart, gizzard, proventriculus, Spleen and Intestine were weighed, and the gizzard and heart weight have non-significant and other (liver, spleen, intestine) have significant effect on the absolute internal organ of broiler.

Keywords: Broiler birds; Moringa oleifera leaves; Body weight gain; Organs parts; Growth performance

Introduction

The poultry sector one of the highest energetic sections in different organized of the industries of agriculture in Pakistan. The employment generates in this sector and 1.5 million people income from it. In this sector the agriculture input is 5.77% and the livestock sector is 10.5%, and the constant GDP 1.2%. The industries of poultry are facing some problems in early growth and active biological activities as per the requirement of the market for enhancing the socio-economic status of the poultry oriented community in the under developing country. The cost amount of feed to a significant proportion of comprehensive livestock production system [1]. According to a reported that, cost of feed represents up to 60%-80% of the whole broiler chicken production cost [2]. Sunflower, which is one of the conventional feed resources and used for the purpose of animal protein and poultry diets due to unavailability of cheaper alternative protein sources in many countries. From various leaves of plants, the amount of protein present which may be fed to poultry in leaf form meals protein [3]. In poultry broilers and layers farm diets various leaf meals have been used which was *Leucaena*, *Centrosema*, *Amaranths* these diets have behave value for poultry feedings. *Moringa oleifer*a leaves meal which also such non-conventional feedstuff. *Moringa oleifer*a which is also speedily growing tree which has been used by the early Egyptians, Romans and Greeks as forage of animals, domestic cleaning agent, blue dye, green manure, gum, fencing, fertilizer, medicine and powder seeds are used for water purification [4]. *Moringa oleifera* good source of amino acids and Vitamins, and it has medicinal uses. *Moringa oleifera* leaf is reported to have potentially antioxidant phytochemicals and potential prebiotic effects. *Moringa oleifera* otherwise regarded as a "miracle tree" is reputed that which have properties of have many medicine [5]. *Moringa oleifera* leaves meal are rich in carotene level and ascorbic

acid with a good amino acid profile [6]. Broiler growth performance had reduced when *Moringa oleifera* leaves meal was beyond a 5% of addition in the broiler feed [7]. Productive performance of broiler had no negative effect when *Moringa oleifera* leaves meal up to a level of 10% addition in the feed. However, *Moringa oleifera* leaf meal levels above 10 % produce adverse effects [8]. The pure leaf meal is not removed, tinctured as a leaf extract. Furthermore, the low performance at higher inclusion level could be due to high level of dustiness and anti-nutritional factors of *Moringa oleifera* leaves meal and low digestibility protein present in the raw leaf, energy and fiber [9]. In the intestinal tract part of these Non-Starch Polysaccharides is water-soluble which is notorious for forming a gel like viscous consistency [10] thus gut performance reducing. The current mission was scheduled to carry out the influence of *Moringa olifera* on growth performance of broiler.

Materials and Methods

The experiment was carried out at the Poultry Research Unit of the Department of Poultry Nutrition, Sindh agriculture university, Tandojam, Pakistan, with the approval of the Committee for Animal Experiments of the Institution.

Source and processing of *Moringa oleifera* leaf meal

*Moringa oleifer*a leaves were harvested at its flowering stages in the morning hours of the day from different location of Tandojam city, Hyderabad. Collected leaves from *Moringa oleifer*a trees spread out under the shade for four days. The *Moringa oleifer*a leaves was removed manually by hand and milled into powder form using a locally made miller machine.

Nutritional values of *Moringa oleifera*

The medicinal value the leaves of *Moringa oleifer*a are in great demand. Medicinal uses of *Moringa oleifera* was described a good source of amino acids and vitamins [7]. Carotenes are rich in *moringa oleifera* leaves and vitamin C, noble profile of amino acid (Makkar et al. [6]). The testimonial of trees shrubs was founded proximate analysis including CP (crude protein), CF (crude fibers)

High protein profile of *Moringa oleifer*a was mentioned reward of leaves of *moringa oleifer*a. The dried leaves have following nutrients of palatable protein *Moringa oleifera* leaves (Table 1); (Figure 1).

Table 1: Nutrient values of Moringa oleifera leaves.

Nutrient/Parameter	MOLM (100gram)
Crude protein	27.4
Crude fiber	9.13
Ether extract	6.3
Ash	11.12
Nitrogen free extract	44.31
ME kcal/kg	2978
Calcium	1.42
Phosphorus	0.35

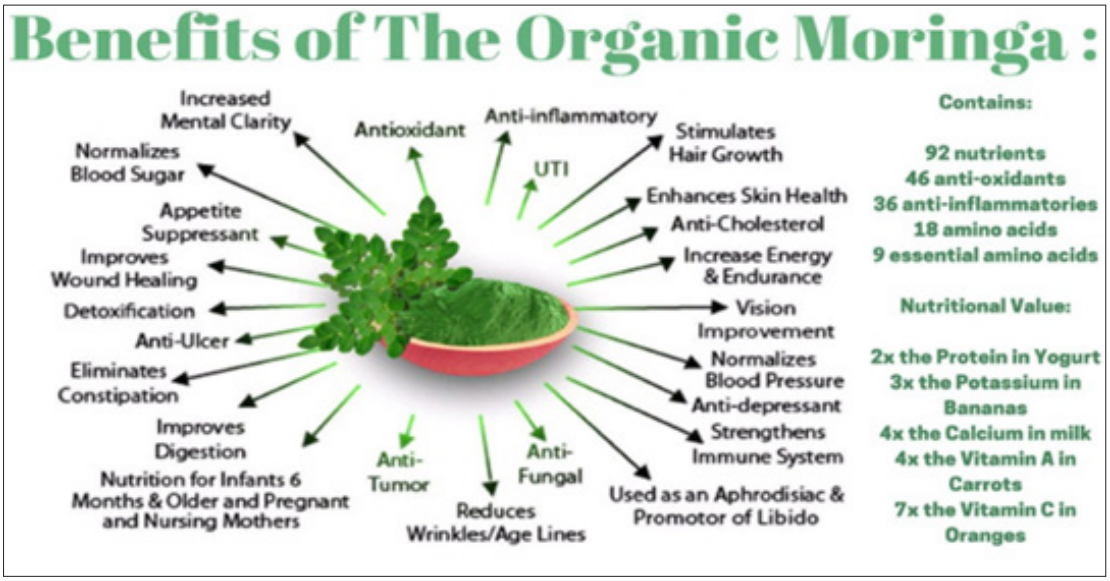

Figure 1: Different nutrients contains of *moringa oleifera* leaves.

Experimental birds and housing

Two-hundred-day-old Ross chicks (*Gallus gallus domesticus*) were purchased from a commercial distributor hatchery of Hyderabad. After initial weight the chicks were first brooded together on deep litter system for one week. Then chicks were arbitrarily separated in four groups, i.e. A (control) was offered 0 % *Moringa oleifera* meal whereas; 1.25% (group B), 2.5% (group C) and 3.75% (group D) *Moringa oleifera* leaves meal. Each group were consisted of 50 birds these are presented in (Table 2).

Table 2: Experimental birds and housing.

Groups	A	B	C	D
Supplementation	Basil diets	1.25% MOLM of Feed	2.5% MOLM of Feed	3.75% MOLM of Feed
No. of chicks	50	50	50	50

Feed and water were given twice a day to each group chickens ad libitum. The water/feed which refused was collected daily and finally consumed water/feed was recorded using the formula below.

$$Feed/water\ intake\ (g/L)=\frac{Totalfeed/wateroffered-totalfeed/waterrefused}{Totalbroiler}\times 100$$

Body live weight (g/b)

Before the research work, by electric weight balance chicken were weighed. In every week the birds were randomly selected from each group and weighed during experimental duration (Figure 2).

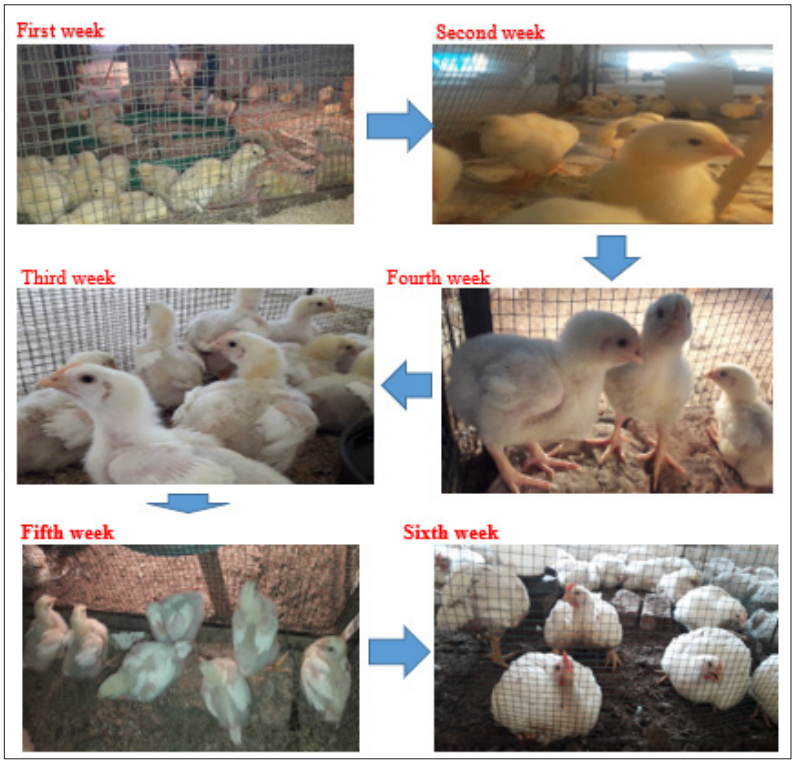

Figure 2: Different stages of growth performance of broiler chicks, Weight gain=Initial weight=Final weight.

Dressing (%)

On the completion of research work, three birds were randomly selected from treatments weighed and slaughtered. The dressing and carcass weight were calculated using the formula bellow.

$$Dressing=\frac{Broilercarcassweight(kg)}{Broilerbodyweight(kg)}\times 100$$

F.C.R

To calculate FCR, increasing weight and intake of feed, were noted by following formula.

$$FCR=\frac{Totalfeedconsumed}{Totalweightgain}\times 100$$

Organs weight

The organ weight was recorded from the organs of the three slaughtered broilers of each group. The weight of gizzard, heart, spleen, liver, intestine and proventriculus were recorded and calculated by formula below;

$$Organweight(\%)=\frac{Broilerorganweight}{Broilerbodyweight}\times 100$$

Data analysis

In Microsoft excel the data was formulated then further analyzed in One-way analysis of difference (ANOVA) through (statistics 8.1 software) and significant variances were associated using the LSD examination procedure ($P<0.05$).

Ration

Initially, the chicks were offered commercial starter/finisher ration. The starter ration was supplied for first three weeks and finisher ration was given for last three weeks. Ration formulation of experimental diets: Crude protein value for Moringa was based on proximate analysis. The following steps were taken in formulating the experimental diets poultry as (Table 3 & 4) according to the recommendation of NRC (1994). The diets were made iso-nitrogenous and iso-energetic to produce broiler starter and finisher 20% and 18% crude protein respectively.

Table 3: Ingredients and formulation of basal diet (Starter/kg).

Ingredients	Starter/kg			
	A	B	C	D
Rice Broken	31.3	31.3	31.3	31.3
Maize	30.5	30.5	30.5	30.5
Fish meal	6.5	6.5	6.5	6.5
Soybean meal	24.4	24.4	24.4	24.4
Sunflower meal	5	3.75	2.5	1.25
Moringa oleifera meal	0	1.25	2.5	3.75
Molasses	0.552	0.552	0.552	0.552
Limestone	0.554	0.554	0.554	0.554
Salt	0.25	0.25	0.25	0.25
Soda Bi Carbonate	0.0111	0.0111	0.0111	0.0111
Premix Vitamin	0.05	0.05	0.05	0.05
Premix Minerals	0.05	0.05	0.05	0.05
Dietary Methionine	0.3155	0.3155	0.3155	0.3155
L-Methionine	0.05	0.05	0.05	0.05
Lysine Sulphate	0.3498	0.3473	0.3423	0.3448
L-Threonine	0.0876	0.0876	0.0876	0.0876
Diclazulin	0.02	0.02	0.02	0.02
Antibiotics	0.01	0.01	0.01	0.01
Phytase enzyme	0	0.0025	0.0075	0.005
Over-all	100	100	100	100

Table 4: Ingredients formulation of diet (Finisher/kg).

Ingredients	Finisher /kg			
	A	B	C	D
Rice Broken	25.6	25.6	25.6	25.6
Maize	38	38	38	38
Fish meal	6.5	6.5	6.5	6.5
Soya bean meal	21.6	21.6	21.6	21.6
Sunflower meal	5	3.75	2.5	1.25
Moringa oleifera meal	0	1.25	2.5	3.75
Molasses	0.3	0.3	0.3	0.3
Oil	1.3817	1.3817	1.3817	1.3817
Limestone	0.4	0.4	0.4	0.4
Salt	0.187	0.187	0.187	0.187
Soda Bi Carbonate	0.0829	0.0829	0.0829	0.0829
Premix Vitamin	0.05	0.05	0.05	0.05
Premix Minerals	0.05	0.05	0.05	0.05
Dietary Methionine	0.312	0.312	0.312	0.312
L-Methionine	0.05	0.05	0.05	0.05

Lysine Sulphate	0.3756	0.3731	0.3681	0.3706
L-Threonine	0.1008	0.1008	0.1008	0.1008
Diclazulin	0	-	-	-
Antibiotics	0.01	0.01	0.01	0.01
Phytase enzyme	0	0.0025	0.0075	0.005
TOTAL	100	100	100	100

Vaccination

Table 5: Schedule of vaccination for experimental broiler chicks.

Vaccines	Days	Routes
I.B + ND	1 – 3	Eye Drops
IBD vaccine	12-Oct	Distal Water
H.P. Syndrome	16 - 17	S/C. (½cc)
IBD vaccine	22	Distal Water
Newcastle disease (ND)	28	Distal Water

The following vaccination program were adopting according to the approval of Pakistan Poultry Association time to time which are given under schedule (Table 5) during experiment.

Results and Discussion

Review of literature suggested that addition of *Moringa oleifer*a has great result on growth performance. This study demonstrated that given of *Moringa oleiferia* leaves meal produce fruitful results like increased feed intake, body weight, dressing percentage of broiler chicks. The gizzard and heart weight have non-significant and other (liver, spleen, intestine) have significant effect on the absolute internal organ. In current study, growth performance was observed high in supplementation of *Moringa oleifera* in treatments group as compared to control.

Nutrient composition of diets

In both starter and finisher diets, it could be observed that increasing the level of MOLM in diet was followed by an increase in Ash, crude fiber and ether extract. However, the reverse was the case with crude protein and nitrogen free extract, which tend to decrease with increasing levels of MOLM.

Body weight

Analysis of variance showed that there were significant differences between the weight of birds amongst the four treatments ($P<0.01$). The results of body weight of birds were noted in treated groups which were supplemented of *Moringa oleifera* compared with un-supplemented group A. The maximum chicken body weight was noted in group C, as compared to group B. The average body weight was further decreased in group D and minimum in group A (control). The presence of *Moringa oleifera* leaf meal in group C diet recorded significantly ($P<0.05$) the maximum body weight gain. The reason for the advanced weight gain can be credited to high protein content of Moringa leaf meal as claimed by Olugbemi et al. [7] & Kakengi et al. [11].

Feed intake

The intake of feed was analysis in different groups of chicks the feed intake was maximum in treatment group C, as compared to group D. The average intake of feed was further decreased in group B. Feed intake was minimum in group A (control). The results showed that in group C feed intake was higher than group B, D and A (control). In view of investigation the visible increase in feed intake might be attributed to increased largeness of the feed and metabolizable energy concentration of the diets. The reduced intake of diet in group a (control) may be due to excessive crude fiber content which may invariably decrease palatability [11]. There was a significant decrease in the feed conversion ratio of the birds fed *Moringa oleifrea* leaf meal-based diets than birds that are fed without *Moringa oleifrea* leaf meal. This suggests that birds fed *Moringa oleifrea* leaf meal-based diets had better utilization potential of the nutrients probably because of the increased bulkiness as inclusion level increased.

Water intake

The water intake was analysis in different groups of chicks. The water intake was minimum in group a (control) as compared to group D. The average intake of water was further decreased in group B and maximum in group C, the significant difference was noted in water intake among different groups, respectively. Decreased in water intake in treated groups is due to increased feed intake while makes chicks thirstier. Water consumption of broiler chicks will be affected by salts and other substances Bozin et al.

Dressing (%)

The dressing percentage of different groups were examined, the maximum dressing percentage was noted in group C, as compared to group D. Average dressing (%) was in treatment group B and minimum in group A (control), In group C, the dressing percentage was higher than group B, D and group A (control). There was significant ($p<0.05$) difference in dressing percentage between

those fed the *Moringa oleifera* leaf meal diet and birds fed control diet. The reduced dressed weight at increased inclusion level could be as a result of effect of fiber which increased in the diets at higher presence level of MOLM in the diets. The result of the dressing percentage characteristics in this study is similar to the finding of Nuhu [12], who reported that there were no significant differences among treatments for dressing percentage characteristic fed *Moringa oleifera* leaf meal (Table 6).

Table 6: Different organs parts, liver, Heart, gizzard, proventriculus, Spleen and Intestine were weighed and dressing %.

Parameters	Groups				
	Group A	Group B	Group C	Group D	P- Value
Dressing %	60.18^{d}	60.77^{c}	66.06^{a}	63.52^{b}	<0.001
Liver	58.06^{b}	62.29^{ab}	66.60^{a}	56.86^{b}	<0.0131
Heart	12.42^{c}	13.47^{b}	15.18^{a}	13.36^{b}	<0.003
Gizzard	23.22^{b}	26.58^{a}	27.89^{a}	26.69^{a}	<0.2612
Proventriculus	9.38^{b}	10.34^{b}	12.14^{a}	11.86^{a}	<0.0007
Spleen	2.73^{b}	3.89^{a}	2.72^{b}	3.76^{a}	<0.0037
Intestine	143.34^{b}	149.31^{a}	151.42^{a}	148.97^{a}	<0.009

FCR %

The FCR of different groups were examined and the FCR was minimum in treatment group C and in group A (control) was higher than treatments groups the non-significantly variance founded respectively. This was in agreement with the report by khule et al. [13], that non-conventional feed stuff often decreases feed cost. This confirms that there is better economic gain by feeding MOLM to broilers since it has the potential of reducing feeding cost of broilers. Ebenebe et al. [14], who sated that birds fed on *Moringa oleifera* leaf meal-based diets be heaved considerably improved than the chicks of control group in terms of increased weight gain and fostered feed conversion ratio. This supports the conclusion of several researchers that leaf meal supplementation in poultry rations has been proved as means of reducing cost and improving profit margin.

Organs characteristics

Different organs parts, liver, Heart, gizzard, proventriculus, Spleen and Intestine were weighed and exposed to significant effects (Table 6). The liver weight was examined, and the results were presented the average liver weight of group C followed by group A (control), B and D treatment groups respectively. Dey and De (2012) founded the differentiation in liver weight with various percentage of *Moringa oleifer*a leaf in diet. Four dietary treatments show that there is significant difference on liver weight but with increase percentage of *Moringa oleifer*a leaf, slightly weight of liver increased. Early development of the liver is due to high priority in supplying nutrients to the rest of the body to support later growth providing a frame on which muscle can accumulate [15]. In poultry, the liver is the primary site of fatty acid synthesis [16]. The spleen weight was examined and the results were presented the average spleen weight of control (A) was 2.73g followed by B, C and D treatment groups (3.89g, 2.72g and 3.76g), respectively. This increased in spleen might be due to increased body weight because as weight increase, relative organs also increased in weight. Ayssiwede et al. (2011) also highlighted earlier, that there was no visible differentiation throughout treatment except for spleen, lung their weight was higher significantly in chicks provided *Moringa oleifera* leaf meal. The four dietary treatments show that there is significant difference on spleen weight but with increase percentage of *Moringa oleifera* leaf, slightly weight of spleen increased.

The gizzard weight of control and treated groups were analyzed, and average results of group (A) was lower followed by C, D and B groups, however, significantly differ with control group, respectively. Such morphological changes supposedly caused by plant feed additives may provide further information on possible benefits to the digestive tract Issa et al. (2012). The heart weight of different groups was analyzed, and the average Heart weight were noted in control group (12.42g) and treated groups B, C and D (13.47g, 15.18g, and 13.36g), respectively. These results show non-significant different in heart weight in different treated groups. Similarly, Ayo-Ajasa et al. (2016) reported that heart weight slightly increased in different treated groups. According to Havenstein et al. (2003), with genetic selection, heart size as a percentage of live body weight has decreased in reverse amount to the improved growth rate and other growth-related traits. Hence, there is a prevalence of flip over death from birds with rapid growth rates. The intestine weight of different groups analyzed, and the intestine weight of groups D was higher than rest of groups.

The cause for this is unknown as *Moringa oleifera* leaf meal there was showed non-significant difference among treatments and control (A) group, respectively. Such morphological changes in gastrointestinal tissues may provide further information on possible profits to the digestive tract [17]. The gastrointestinal tract undergoes morphological variations, which include the increase in intestinal length, villous height and density, accompanied by an increase in digestive enzymes increasing the digestion surface area and absorption during the post-hatch period Panda et al. (2006). Dietary addition of short chain carbohydrates found in glycoside attachments in *Moringa oleifera* leaves have been reported to cause a major increase in the height of the jejuna villi [18]. The increase of

villous height of different small intestine segment may be attributed to the role of the intestinal epithelium as a natural barrier against pathogenic bacteria and toxic substances that are present in the intestinal lumen [13]. The Proventriculus weight of different groups was observed and result showed that the average proventriculus weight of group control (A). The weight of periventricular decrease with different concentration of *Moringa oleifera* leaf treatments the significant difference was founded in treated groups and (control) A group, respectively. Weight of proventriculus decrease with different concentration of *Moringa oleifera* leaf. Alabi et al. (2017) [19,20].

Conclusion

It is concluded from present study that, 2.5% *Moringa oleifer*ia leaves showed to be more profitable as compared to rest of the treatments groups B, D and control group (A). The broiler birds supplemented with *Moringa oleifera* resulted more gain of chicken's body weight and better growth performance of broiler.

Suggestions

On the basis of conclusion, it could be suggested:

a) For better conversion ratio, the broiler feed should be added with supplementation of 2.5% *Moringa oleiferia* leaves.

b) Research should be conducted to investigation the optimum dose of supplementary of 2.5% *Moringa oleiferia* leaves under different production system.

Moreover, the research should be carried to investigation the influence of 2.5% *Moringa oleiferia* leaves on the growth performance in other avian species.

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