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Effect of Moringa oleifera leaf powder on growth performance of Japanese quail under deep litter system

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Abstract
The present research work was designed to evaluate the productive performance of quails chicks by substituting the four different concentration of *Moringa oleifera* leaf powder (0%, 1.5%, 3% and 4.5%) by weight basis in feed. A total of 108 day old chicks were procured and after two weeks of brooding they were randomly divided into four experimental groups. Each group was further subdivided into 3 replicates containing 9 chicks in each. Different combinations of feed were offered to them for a period upto 12 weeks. The investigation of above research work showed that birds fed on diets containing *Moringa oleifera* leaf powder (MOLP) gains significantly higher body weight gain and having more body weight gain than that of birds feeding on control diet (0% MOLP).
It could be concluded that inclusion of MOLP at 1.5%, 3% and 4.5% in quails diets improves the growth performance than control diet however, the best result on growth performance was shown by the birds fed on 1.5-3% MOLP.

Keywords: *Moringa oleifera* leaf powder (MOLP), Japanese quail, Growth performance

Introduction
Japanese quail (*Coturnix coturnix japonica*) was first introduced in India from California University in 1974 as a new poultry species at Central Avian Resarch Institute, Izatnagar, Bareilly (U.P). Quail is popularly known as 'Bater' in Hindi. Quail is the most efficient biological machine for converting feed into animal protein of high biological value and hence is the cheapest source of animal protein for human diets. The Japanese quails serve as a good source of food and provide good animal protein in many underdeveloped areas of world (Chaturvedi, 1973) [1]. Many of the Asian countries are suffering from deficiency of animal protein which can be obtained from milk, meat, fish, eggs and from the poultry species.
The products of Japanese quail are highly nutritious and delicious which require proper attention for modern scientific quail farming. Now a day, commercial quail farming is getting popularity in India, because the investment and maintenance is very less as compared to other birds.
Being a herbal plant, *Moringa oleifera* is considered as the most efficient because leaves contain higher amount of protein besides its several therapeutic and medicinal uses. Moringa is the sole genus in the flowering plant family *Moringaceae*. It is locally known as Munga or Sahjan. One such plant is commonly known as the drumstick tree (Makker and Becker, 1997) [2]. The leaves of the trees have been reported to have an antioxidant activity due to higher amount of polyphenols (Mayo *et al*., 2012) [3] and are a rich source of vitamins. Its leaf meal may be a promising source of natural antioxidant for broiler meat. It also possesses antimicrobial activity due to its principle component pterygospermin. There are numerous uses of *Moringa oleifera* as medicine. The pantropical cultivation and easy propagation of Moringa tree justify more intensive research into its biological and economic possibilities, particularly as useful feed ingredients and medicine.

Materials and methods
The present study was conducted at Avian Research Development Centre, Deptt. Of Livestock

Production and Management, Ranchi Veterinary College, Ranchi.

Experimental birds and design

A total of 108 day old unsexed birds of Japanese quail were procured having nearly equal body weights were divided into four treatment groups (T0, T1, T2, T3) contained 27 chicks per group having three replicates of 9 chicks each. All the birds were offered isocaloric and isonitrogenous diets containg approx 24% CP from (0 to 6th weeks of age) and 20 % CP from (0 to 6th weeks of age). MOLP was not included in control diet (T0), while it was included in group T1,T2 and T3 at the rates of 1.5, 3.0 and 4.5 percent by weight substituting soyabean oil cake by same properties. The feed were provided twice daily at 8.30 am in morning and at 5 pm in the evening. Water was provided ad lib. The litters were made on the floor consisting of saw dust spread over the floor about two inches in thickness. Space was provided as per standard in deep litter system of management.

The body weight of birds was recorded at 0 day, and at weekly interval up to 12 weeks of age in the morning before offering the feed. Residual feeds were collected daily and weighed for the calculation of other parameters during the experimental period.

Data obtained after experiment were analyzed as per the standard statistical methods described by Snedecor and Cochran (2004) [4], applying one way ANOVA by using IBM SPSS (Statistical Package for the Social Sciences) statistics software.

Results and discussion

Effect of MOLP shows (Table no.1) significantly higher body wt. at 6th weeks and 11th weeks (P≤0.01) of age and also from 5th to 12th weeks (P≤0.05). In the above mentioned period the effect of MOLP on the average body weight under different treatments (T1, T2 and T3) shows significant higher body weight in comparison to the control group. Overall highest average body weight was found in T1 group (120.40±17.06) g than other treatment groups, however it was not significantly different from other treatment groups (T1 and T3).

The results of present experiment are in tune with the reports of Banjo (2012) [5] who revealed that the inclusion of *Moringa oleifera* leaf meal with 1,2 and 3% levels in the diet of the broilers significantly (P<0.05) increased their weight at 1% level which was significantly higher than the control. Similarly, the findings of Dey and De (2013) [6] are also in accordance, they reported that 0.25 or 0.40 % MOLM in broiler diets shows a significant (P< 0.01) improvement in body weight in comparison to control group. The present results are also in agreement with the findings of Teteh *et al*. (2013) [7] was observed that overall chick weights was increased significantly with age (P<0.05) using 1 and 2 % MOLM in comparison to the control group.

On the other hand findings of Makanjuola *et al*. (2014) [8] are not in harmony with the above findings, They found no significant changes in final body wt of broiler chickens when fed with 0.2, 0.4 and 0.6% MOLM to the diets for 28 days. Similarly, Paguia *et al*.(2014) [9] also reported non significant changes in body wt when 0.20%, 0.30%,0.40% and 0.50% MOLM were incorporated into the diets of broiler chicken.

The results of above research works were might be due to the more protein content and higher digestibility of MOLP.

Effect of MOLP shows (Table no.2) significantly different body weight gain (P≤0.05) at 6th and 8th weeks, and also at 5th,7th and 12th weeks (P≤0.01).In 5th,6th and at 7th weeks of age the highest body wt. gain were found in T1 group. At 8th weeks of age highest body wt gain was found in T3 treatment group whereas in case of 10th and 11th weeks of age highest body wt. gain were observed at T2 group. At 12th weeks of age highest body wt. was found in control group. In case of 9th week the body wt. gain was found non-significant and was lowest for T3 group (14.60±1.17).

The results are in accordance with the finding of Ebenebe *et al*. (2012) [10] who found that chicks fed on Moringa based diets performed significantly (P<0.05) better than the birds under control group in term of their higher weight gain. The results of present experiment are also in tune with the reports of Banjo (2012) [5], who revealed that the inclusion of *Moringaoleifera* leaf meal with 1,2 and 3% levels in the diet of the broilers significantly (P<0.05) increased their weight gain at 1% level which was significantly higher than the control. Similarly, the findings of Dey and De (2013) [6] are also in accordance, they reported that 0.25 or 0.40 % MOLM in broiler diets shows a significant (P< 0.01) improvement in Body weight gain in comparison to control group. The present results are also in agreements with the findings of Teteh *et al*. (2013) who observed that overall chick weights was increased significantly with age (P<0.05) using 1 and 2 % MOLM in comparison to the control group.

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The results of above research works were might be due to the more protein content and high nutritive value of MOLP.

Conclusion

On the basis of above finding it could be concluded that inclusion of *Moringa oleifera* leaf powder (MOLP) at levels of 1.5%-3% of the quail's diet improved the growth performance.

Table 1: Effect of MOLP on Average Body Weight (gm) of Japanese Quail under Deep Litter System of Management.

AGE/Treatment	T0	T1	T2	T3	SIG.
O DAY	6.04±0.08				
1st wk	11.34±0.56(BROODING PERIOD) (108)				
2nd wk	20.31±0.20(BROODING PERIOD) (108)				
3rd wk	34.50±1.96	38.17±0.70	36.00±0.96	36.83±0.65	NS
4th wk	57.50±2.78	60.83±2.24	55.83±1.04	55.50±1.38	NS
5th wk	63.50±3.40	63.17±2.24	67.00±2.68	72.17±3.91	NS
6th wk	81.50±2.51^{a}	100.50±1.72^{b}	101.17±4.28^{b}	105.50±2.21^{b}	**
7th wk	102±2.95^{a}	124.83±2.71^{b}	113.67±8.71^{b}	122.17±2.54^{b}	*
8th wk	104.50±5.05^{a}	127.00±7.72^{b}	132.83±9.57^{b}	123.17±5.60^{b}	*

9th wk	125.67±3.64[a]	148.67±5.52[b]	151.67±7.55[b]	147.33±6.04[b]	*
10th wk	139.50±2.74[a]	161.67±3.50[b]	152.83±5.20[b]	151.00±3.13[b]	*
11th wk	155.00±5.36[a]	182.50±1.92[b]	179.33±2.48[b]	173.83±3.35[b]	**
12th wk	172.50±6.97[a]	193.33±4.58[b]	202.83±0.79[b]	199.33±3.87[b]	*
OVERALL	103.61±14.20	120.40±17.06	119.32±17.32	118.68±16.48	

Each value is the average of 27 observations.
* P < 0.05, ** P < 0.01, NS = Non-Significant

Table 2: Effect of MOLP on Average Body Weight Gain (gm) of Japanese Quail under Deep Litter System Of Management.

Age/Treatment	TO	T1	T2	T3	SIG.
1st wk	5.15±0.32(BROODING PERIOD)(108)				
2nd wk	9.30±1.10(BROODING PERIOD) (108)				
3rd wk	15.73±0.39	16.17±0.33	16.00±0.25	16.03±0.31	NS
4th wk	20.37±0.42	20.52±0.48	20.27±0.20	20.33±0.33	NS
5th wk	10.60±0.30[a]	18.94±0.46[c]	14.72±0.46[b]	15.17±0.60[b]	**
6th wk	14.93±0.23[a]	33.00±0.57[b]	12.17±5.10[a]	31.67±1.20[b]	*
7th wk	14.10±0.58[a]	21.10±0.49[c]	19.45±0.86[c]	17.48±0.53[b]	**
8th wk	14.13±0.69[a]	14.15±0.51[a]	15.48±1.25[a]	18.61±0.58[b]	*
9th wk	15.07±0.58	15.49±0.47	15.88±0.84	14.60±1.17	NS
10th wk	8.55±0.58[a]	9.35±0.52[a]	13.33±0.49[b]	8.24±0.50[a]	**
11th wk	13.29±0.66[b]	14.29±0.39[b]	21.33±0.88[c]	10.33±0.88[a]	**
12th wk	15.67±0.33[c]	15.00±0.57[c]	11.00±0.57[a]	12.67±0.33[b]	**
OVERALL	14.244±0.99	17.802±2.00	15.963±1.09	16.513±2.04	

Each value is the average of 27 observations.
* P < 0.05, ** P < 0.01, NS = Non-Significant

Table 3: Chemical composition of *Moringa oleifera* leaf powder (MOLP)

Constituents	Amount (per 100g)
Moisture	9
Protein	28.65
Lipid	7.09
Ash	10.9
Carbohydrate	44.36
Calcium(mg)	2.97
Magnesium(mg)	1.9
Zinc	1.58

Table 4: Starter and Grower Ration (0 To 6 Weeks of Age)

Ingredients	Control Ration (Cp%=24.81)	Treatment Ration 1 (Cp%=24.53)	Treatment Ration 2 (Cp%= 24.25)	Treatment Ration 3 (Cp%=24.41)
Yellow Maize (%)	48	48	48	48
Soyabean Cake (%)	32	30.50	29	27.50
Wheat Bran (%)	6.50	6.50	6.50	6.50
Fish Meal (%)	11	11	11	11
Molp (%)	0	1.5	3	4.5
Min.Mix (%)	2	2	2	2
Salt (%)	0.50	0.50	0.50	0.50

Table 5: Layer Ration (6 Weeks onwards up to Experimental Period)

Ingredients	Control Ration (Cp%=20.95)	Treatment Ration 1 (Cp%=20.67)	Treatment Ration 2 (Cp%=20.40)	Treatment Ration 3 (Cp%=20.12)
Yellow Maize (%)	54.50	54.50	54.50	54.50
Soyabean Cake (%)	25	23.50	22	20.50
Wheat Bran (%)	5.50	5.50	5.50	5.50
Fish Meal (%)	8.50	8.50	8.50	8.50
Molp (%)	0	1.5	3	4.5
Oyster Shell Grit	4	4	4	4
Min.Mix (%)	2	2	2	2
Salt (%)	0.50	0.50	0.50	0.50

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