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Effect of *Moringa oleifera* aqueous leaf extract and ascorbic acid supplementation on carcass characteristic and production cost analysis of broiler chicken

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Abstract
A study was conducted to investigate carcass traits and production efficiency of broiler chicken. The experiment was conducted for a period of 35 days on 135 birds divided in to three different treatment groups of 45 birds each T_1 group which served as control were fed only as basal ration. Birds in T_2 group were fed basal ration with MOALE (90 ml/L drinking water) and T_3 group were offered basal ration with ascorbic acid (15 mg/L drinking water). The Carcass characteristics of treatment on relative weight of liver, heart, gizzard, intestine, spleen, bursa, giblet percentage, dressing percentage and eviscerated percentage in broiler chicken were shown non-significant (P>0.05) changes where as relative weight of abdominal fat was significantly differed (P<0.01) between the treatment groups. The production economics of broiler chicken was measured and found that water supplementation of MOALE and ascorbic acid in bird, reduced production cost by improving live weight gain and profit per kg live weight was maximum in MOALE supplemented group followed by ascorbic acid group and least profit was noted in control group.

Keywords: carcass trait, abdominal fat, production efficiency, ascorbic acid

Introduction
Poultry sector plays important role in minimizing the protein and calorie deficiency of large human population of our country. *Moringa oleifera* is nutrient rich high nutritional value species. Hence, supplementation of ascorbic acid and Moringa tree leaf extract could be a possible to improve the carcass trait by reducing the stress of broiler birds with quality product production. This experiment was therefore, conducted to study the *moringa oleifera* aquous leaf extract and ascorbic acid on carcass characteristics and production efficiency of broiler chicken**.** (Onunkwo and George 2015) [7] studied to evaluate the effects of *Moringa oleifera* leaf meal on growth performance and carcass characteristics of boiler chicks and found that significant difference (P<0.05) in organ weights (wings, shank, drumsticks, kidney, liver, gizzard) and cut parts between the experimental and control groups and suggest that *Moringa oleifera* leaf meal can replace protein source (soyabean and groundnut cake) up to 10% in broiler diets without any adverse effects on growth and carcass qualities which could marginally reduce feed cost in broiler production. (Gadzirayi *et al*., 2012) [4] reported that there was significant difference on carcass yield between the different treatments of birds fed on different inclusion level of MOLM and also carcass parts, liver, head, neck, wing, back, thighs, shanks, breast, gizzard and lung, were weighed and exposed to significant tests. (Aderinola *et al.*, 2013) [2] worked on the utilization of *Moringa oleifera* leaf as feed supplement in broiler diets and they observed that cholesterol levels and abdominal fat reduced with increased MOL inclusion in the diets of broiler birds (Cui *et al*., 2018) [3] studied on dietary supplementation of *Moringa oleifera* leaf on performance, meat quality and oxidative stability of meat in broiler chicken and they found that increased feed conversion ratio and decreased abdominal fat linearly in response to the supplementation of MOL in diets.

Materials and Methods
The study was planned to see the comparative effect of water supplementation of *Moringa oleifera* aqueous leaf extract (MOALE) and ascorbic acid as an antioxidant sources in broiler

chicken. One hundred thirty-five day-old broiler chicks were procured from local market reliable supplier during winter season and maximum temperature was approximately around 28 ˚C. The experimental birds were weighed and randomly divided into three experimental groups including control of 45 chicks in each group and further replicated with 15 chicks each as replicate and offered fresh water and crushed maize on first day and then given standard ration as per schedule. Chicks were reared on electrically heated brooder in early age under different treatment groups. All chicks were vaccinated against Ranikhet and Gumboro diseases following standard poultry vaccination protocol. The experiment was conducted for the period of 35 days. All the standard managemental practices were followed during experimental period. Birds in T_1 group which served as control were fed only as basal ration. Birds in T_2 group were fed basal ration with MOALE (90 ml/L drinking water) and T_3 group were offered basal ration with ascorbic acid (15 mg/L drinking water), carcass traits and economy of production were examined.

Preparation of *Moringa oleifera* aqueous leaf extract (MOALE)

Fresh green *Moringa oleifera* leaves were harvested from Bihar Veterinary College Campus, Patna, India. Stems were cut from the mature Moringa trees over twelve months old. All plucked twigs were spread out on a floor and allowed to dry for a period of 3-5 days under shady and aerated conditions. Thereafter, branches were jerked carefully to separate leaves from twigs before grinding. The separated leaves were dried in hot air oven at 45±2 ºC for proper grinding. The dried leaves were milled to make in powder form. The leaf powder was stored air tightly in the nylon bags for further analysis.

After that took 2 litre capacity conical flask and added 1 litre distilled water. Then, took 60 gm MOL powder and kept in a shaker machine for 24 hrs for homogeneously mixing. After 24 hrs took it out and filtered in properly washed glass bottle having cap, using muslined cloth. All debris were discarded and final volume of filtrate was 450 ml and stored the filtrate at 4 ºC for further analysis.

Laboratory analysis

The procured ingredients were analyzed for proximate principles (AOAC, 1995) [1] as well as calcium and phosphorus using the method modified by (Talapatra *et al*., 1940) [12] chemical composition of chicken meat were analyzed.

Statistical analysis

All statistical analyses were performed as per standard method (Snedecor and Cochran, 1989) [11] by using (SPSS 2015) [8] computer package. For comparison of multiple groups Generalized Linear model ANOVA procedures and Duncan's multiple range tests were utilized.

Results

The effect of MOALE and ascorbic acid on carcass traits were found non-significant (P>0.05) as the weight of liver varied between 44.92 g in T1 group to 47.50 g in T2 group and relative weight of liver in birds were found to be non-significant (P>0.05) and comparable among the groups. Similarly, the effect of treatment on relative weight of heart, gizzard, intestine, spleen, bursa, giblet percentage, dressing percentage and eviscerated percentage in broiler chicken were shown non-significant (P>0.05) changes between the treatment and comparable among the groups is shown in (table-1). However, the relative weight of abdominal fat was significantly differed (P<0.01) between the treatment groups and abdominal fat deposits of MOALE group was found to be lowest than ascorbic acid group and control group which might be due to hypocholesteromic properties of moringa. The chemical composition of broiler meat sample was significantly unchanged (P>0.05) and found comparable among the groups. The production economics influenced by different dietary treatment was measured and founded that Total input cost per bird was calculated on the basis of total feed cost and cost of chicks, vaccines and miscellaneous expenditure. The water supplementation of MOALE and ascorbic acid in broiler decreased the production cost by enhancement of live weight gain. However, the profit per kg live weight was maximum in MOALE supplemented group followed by ascorbic acid group and least profit noted in control group.

Table 1: Effect of MOALE and ascorbic acid on carcass traits of broiler chicken

Attributes	T_1	T_2	T_3	SEM	P-value
Liver (g)	44.92 ±3.42	47.50 ±5.05	46.00 ±2.66	5.434	0.893
Heart (g)	10.25 ±1.42	10.75 ±1.42	11.58 ±0.79	1.764	0.751
Gizzard (g)	39.17 ±3.57	37.67 ±1.48	37.08 ±2.74	3.868	0.858
Intestine (g)	91.67 ±4.82	91.92 ±6.26	95.17 ±3.98	7.226	0.865
Abdominal fat (g)	19.57 [b] ±1.73	11.02 [a] ±0.73	17.30 [b] ±1.12	1.785	0.001
Spleen (g)	4.50 ±0.67	3.33 ±0.95	4.17 ±0.31	0.985	0.492
Bursa (g)	3.35 ±0.57	2.85 ±0.31	2.68 ±0.26	0.572	0.502
Giblet %	7.73 ±0.66	7.46 ±0.39	7.33 ±0.28	0.664	0.829
Dressing %	71.11 ±0.71	70.40 ±0.50	70.80 ±0.28	0.746	0.642
Eviscerated %	60.03 ±0.82	59.94 ±0.73	60.20 ±0.43	0.964	0.964

[ab] Values with different superscripts in a row differ significantly (P<0.05; P<0.01)

Discussion

The above results recommended that *moringa oleifera* aqueous leaf extract and ascorbic acid supplementation having improved meat quality and economic in production, respectively. The present result agreed (Zanu *et al*., 2012) [15] found that *Moringa oleifera* leaf meal supplementation in broiler chicken diets had not any significant (P>0.05) effect on carcass characteristic parameters. (Aderinola *et al*., 2013) [2] reported that supplementation of *Moringa oleifera* leaf in broiler diets, decreased abdominal fat proportion was noted and the utilization of MOLM in broiler diet could be adopted when the motive is production of broiler meat with low fat deposit is targeted. However, (Safa 2014) [9] revealed that the inclusion of MOLM in broiler diets significantly (P<0.05) improved hot and cold eviscerated carcass weight, dressing percentage, breast and drumstick percentages for both breast and thigh meat. (Younis and Elbestawy 2017) [14] reported that the water Supplementation of *Moringa oleifera* in broiler birds had no any significant effect between treatments in carcass characteristics. (Cui *et al*., 2018) [3] found that the

dietary supplementation of *Moringa oleifera* leaf in broiler chicken had decreased abdominal fat linearly. (Karthivashan *et al*., 2015) [5] revealed that the supplementation of *Moringa oleifera* leaf extract could be an efficient and cost-effective feed supplement for broiler production. (Kumar *et al*., 2018) [6] reported that the supplementation of 5% followed by 10% *Moringa oleifera* leaf meal in cross breed indigenous birds shown significant improvement in overall performance achieving maximum profit. (Tesfaye *et al*., 2018) [13] assessed the feeding value of MOLM in layer ration and suggested that 5% inclusion of MOLM as an additive in the poultry industry may serve the sector by enhancing the product quality besides serving as protein feed. However, (Sigolo *et al*., 2019) [10] reported that supplementation of vitamin E and C at different levels could enhanced Japanese quail production and got more profit.

Conclusions

Our finding determined that abdominal fat deposit was significantly reduced without affecting carcass quality, however, maximum profit obtained in MOALE group followed by ascorbic acid supplemented birds.

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