

Effect of Amla Powder on Meat Composition and Carcass Traits in Broiler

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ABSTRACT

To study the effect of dietary supplementation of amla fruit powder on meat composition and carcass traits of broiler chicken meat, 300 commercial broiler chicks were randomly distributed into six treatments having five replicates consisting of ten birds each. The chicks fed with standard basal diet in two different growth phases i.e. starter (0-28d) and finisher (29-42 d). The first group was kept as control (T_1) and given the basal diet without antibiotic, while second group (T_2) was given basal diet with antibiotic. In third (T_3), fourth (T_4), fifth (T_5) and sixth (T_6) groups, basal diet was supplemented with amla fruit powder @ 0.25%, 0.50%, 0.75% and 1% respectively. The birds were weighed fortnightly to calculate performance parameters viz. feed intake, body weight change and FCR. Dressing percentage of different dietary treatments ranged from 76.35% (T_2) to 77.35% (T_5) and didn't differ significantly between the supplemented and the control group and highest eviscerated percentage was obtained with supplementation of basal diet with 0.75% amla supplemented group (T_5) but difference was non-significant with other groups. Drawn percentage of different dietary treatments ranged from 69.46 % (T_1) to 70.26% (T_4) and drawn percentage was significantly higher in T_4 (basal diet supplemented with 0.50% amla powder). Under different dietary treatments giblet percentage was ranged between 4.11% (T_1) to 4.77% and significantly ($P<0.05$) higher giblet percentage was obtained in dietary treatment T_4 and T_5 . Abdominal fat percentage under different dietary treatments ranges from 1.08 % (T_6) to 1.44% (T_1) and groups supplemented with higher levels of amla fruit powder showed significant reduction in abdominal fat percentage. Moisture percentage and crude protein content of both breast and thigh muscle did not differ significantly among treated and control group while, fat percentage in both breast and thigh meat decreased significantly in amla supplemented group as compare to control group.

Key words: Abdominal fat, Amla, Drawn percentage, Dressing percentage, Hypolipidemic

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INTRODUCTION

Poultry industry in India has emerged as one of the fastest growing segment of the agriculture sector. It is projected that during the period 2000-2020, total poultry meat consumption is likely to expand from 687 million kilograms to 1674 million kilograms¹. The annual per capita consumption of broiler meat in India is only 2.96 kg which is much less than the ICMR recommendation of 11 kg. It indicates that broiler production in India is yet very low and has vast scope for growth. Over a period of time, extensive efforts have been made to lower down the cost of production by lowering the expenses on feed. Feed additives are one of the important tools used for improving feed conversion ratio, growth rate and disease resistance. The range of feed additives used in animal production industry is very broad ranging from growth promoters to disease preventing agents. Supplementations of these agents in poultry nutrition are mainly aimed to improve digestibility and bioavailability of various nutrients, thereby, enhancing economic gains by reducing the input costs. Herbs, spices and various plant extracts have received increased attention as possible antibiotic growth promoter replacements. In this view, the plants identified with properties of secondary metabolites became interesting due to their antimicrobial, antioxidant effects and their stimulating effects on animal performance and digestive enzymes. In poultry health management, *Emblica officinalis* has been widely used as growth promoter, immunomodulator² and antioxidant^{2, 3}. The key bioactive principles of amla fruit are flavonoids, phyllembin, ascorbic acid, gallic acid, alkaloids and tannins. Vitamin C, tannins and flavonoids are found in maximum concentration and exhibits antioxidant action⁴. Amla (*Emblica officinalis*) has the ability to stimulate natural antioxidant enzyme system including catalase, superoxide dismutase and glutathione peroxidase^{5, 6}.

Ethical approval: The animal experiment was conducted in accordance with guidelines approved by the Institutional Animal Ethics Committee, 12/CPCSEA Dated 6.2.2017 in the Department of Animal Nutrition, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar

Experimental design

Completely Randomized Design (CRD) was used as experimental design at uniform and standard management practices.

MATERIAL AND METHODS

A total of 300 commercial broiler chicks (Ven Cobb strain) were randomly distributed into six treatments having five replicates consisting of ten birds each. The chicks fed with standard basal diet in two different growth phases i.e. starter (0-28d) and finisher (29-42 d). The first group was kept as control (T₁) and given the basal diet without antibiotic, while in second group (T₂) basal diet was given with antibiotic. The diet in third (T₃), fourth (T₄), fifth (T₅) and sixth (T₆) groups were supplemented with amla fruit powder @ 0.25%, 0.50%, 0.75% and 1%, respectively. The birds were weighed fortnightly to calculate growth performance parameters viz. feed intake, body weight gain and FCR.

Carcass traits

For carcasses evaluations, five birds per dietary treatment (one from each replicate) were selected randomly, at the end of 6th week. The birds were kept off feed and water was withdrawn three hours prior to their sacrifice. Immediately after recording their live weights, the birds were killed by severing the jugular vein and allowed to bleed completely following Halal method. Their heads were removed at the atlanto-occipital joint and shank at hock joint. The dressed weight thus obtained was recorded as follows.

Dressed weight = Live weight - (blood + feathers + head shank + skin losses).

Dressing percentage was calculated as follows.

$$\text{Dressing percentage} = \frac{\text{Dressed weight}}{\text{Live weight}} \times 100$$

Dressed birds were then eviscerated by removing the crop, trachea and viscera as a whole. A horizontal cut was given rear to the keel bone, thereby the breast was a little upturned and pushed forward, exposing the viscera along with the visceral organs, which were then removed completely by pulling. The lungs were scrapped off and the heart, liver and gizzard constituting giblets, were removed

carefully from the viscera. The gall bladder was removed with care from liver to avoid its puncture. The gizzard was opened and its contents washed out and inner epithelial lining discarded. The heart was made free from blood and adhering vessels. The eviscerated and drawn weights were recorded and their percentage was calculated. Eviscerated weight = Dressed weight - weight of viscera

$$\text{Eviscerated percentage} = \frac{\text{Eviscerated weight}}{\text{Live weight}} \times 100$$

$$\text{Drawn weight} = \text{Eviscerated weight} + \text{weight of giblets}$$

$$\text{Drawn percentage} = \frac{\text{Drawn weight}}{\text{Live weight}} \times 100$$

Separate weight of heart, liver and gizzard were also recorded after washing and bloating, and their relative weights (percentage of live weight) were then calculated.

Carcass composition

Samples of breast and thigh muscles were taken from each of the slaughtered birds and stored in deep-freeze separately for further analysis. These samples were analyzed for moisture, protein and ether extract as per AOAC⁷.

Evaluation of feed ingredients

Feed ingredients used for ration formulations were evaluated for proximate nutrients. The evaluated and measured values of feed ingredients used in preparing the experimental diets are presented in **Table 1**.

Materials used in diet formulation

All feed ingredients, additives and supplements used in the experiment were procured in one lot before the start of the experiment. The ingredients, additives and supplements used in the diet formulation were maize, soybean meal, vegetable oil, fish meal, mineral mixture, vitamins, coccidiostat, lysine, DL-methionine and amla fruit powder. The sources, composition and mixing rate of

additives/supplements used in ration formulations are presented in **Table 2**.

Figuring and composition of diets

Basal ration was formulated as per BIS⁸ to fulfil the metabolizable energy (ME) and crude protein requirements of birds. Level of crude protein in starter (0-4weeks) and finisher (4-6weeks) ration was 22 percent and 20 percent, respectively. The respective ME content was 3000 and 3200 KCal/kg are presented in **Table 1**.

Housing and brooding

The experimental chicks were reared under deep litter system. The floor of the pens was thoroughly cleaned, disinfected before scattering of the bedding material. Well chopped dry wheat straw was used as bedding material to form the litter. The straw was evenly spread upto 5 cm thickness. The litter was regularly raked to avoid any lump formation. Wooden brooders fitted with bulb in the centre were used in each pen for brooding.

Feeding and watering

During the initial period of growth extra care was taken to assure efficient feeding and watering of the chicks so that they could be well introduced and acclimatized. The feeding

programme consisted of a starter diet until 28 days and a finisher diet from 29 to 42 days of age. Weighed amount of feed was offered on paper sheets for first 3 days and thereafter, in the automatic feeders up to 28 days of age. Afterwards, the feeds were offered through hanging feeders maintained at appropriate heights. The chicks were provided *ad libitum* clean drinking water through the plastic waterers during first two weeks of the experiment. Thereafter, bigger plastic waterers were used till the end of the experiment.

Statistical analysis

Data was analysed statistically as described by Snedecor and Cochran¹⁰. Analysis of variance was used to study the differences among treatment means and they were compared by using Duncans Multiple Range Test (DMRT) as modified by Kramer¹¹.

RESULTS

Carcass characteristics

Data pertaining to carcass characteristics of the experimental birds under different dietary treatments are presented in Table 3. Dressing percentage of different dietary treatments ranged from 76.35% (T₂) to 77.35% (T₅) and didn't differ significantly between the supplemented and the control group. Eviscerated percentage did not differ significantly between the control group and other treatment groups and ranged between 64.23 (T₂) to 65.49 (T₅). Highest eviscerated percentage was obtained with supplementation of basal diet with 0.75% amla supplemented group (T₅) but difference was non-significant with other groups. Drawn percentage of different dietary treatments ranged from 69.46 % (T₁) to 70.26% (T₄) and drawn percentage was significantly higher in T₄ (basal diet supplemented with 0.5% amla powder). Under different dietary treatments giblet percentage was ranged between 4.11% (T₁) to 4.77% and significantly (P<0.05) higher giblet percentage was obtained in dietary treatment T₄ and T₅. Abdominal fat percentage under different dietary treatments ranges from 1.08 % (T₆) to 1.44% (T₁) and groups supplemented with higher levels of amla fruit powder showed

significant reduction in abdominal fat percentage.

Composition of Breast meat

Data pertaining to composition of Breast meat of the experimental birds under different dietary treatments are presented in Table 4. Moisture percentage of breast muscles was obtained in the range of 71.67% (T₁) to 72.97% (T₃) and significantly higher moisture percentage was recorded in the groups supplemented with amla fruit powder. Crude protein percentage of different dietary treatments ranged from 22.47% (T₃) to 22.65 % (T₂) and didn't differ significantly among the supplemented and control group. Fat percent in all treatment groups ranged from 3.85 % (T₆) to 4.90 (T₁) and fat percentage was significantly decreased in amla supplemented groups as compared to control group.

Composition of thigh meat

Moisture percentage of thigh muscles under different dietary treatments ranged between 70.03% (T₁) to 71.60 % (T₅). Amla supplemented group T₅, T₆ resulted in significantly higher moisture percentage than the control group. Percent crude protein of thigh muscle ranged from 21.34 % to 21.48% and didn't differ significantly among supplemented group and control group. Fat percentage of thigh muscles ranged from 6.20 % (T₅) to 7.73 % (T₁) and fat Percentage was significantly lower in amla supplemented group as compared to the control group showing hypolipidemic effect of amla.

DISCUSSION

Carcass characteristics

Dressing percentage and Eviscerated percentage of different dietary treatments did not differ significantly between the supplemented and control group. Drawn percentage of different dietary treatments ranged from 69.46 % (T₁) to 70.26% (T₄). Under different dietary treatments giblet percentage was ranged between 4.11% (T₁) to 4.77% and significantly (P<0.05) higher giblet percentage was obtained in dietary treatment T₄ and T₅. Our study agree with the findings of

Mehala and Moorthy¹² who reported that data on carcass parameters in terms of dressed, eviscerated, and drawn yield revealed no significant differences among the groups. In contrary to our study Eevuri and Putturu¹³ reported the effect of herbal remedies (turmeric, tulsi, amla and aloe vera) in broiler feed found increased dressing percentage, liver weight, spleen weight and whole giblet weights in broiler. Kurkure *et al.*¹⁴ stated that dressing per cent and liver per cent on live weight were better in herbal premix fed group having amla as an integral part. Singh *et al.*¹⁵ reported improved dressing percentage and giblet weights in broilers fed diets with amla, turmeric powder and their combination. Abdominal fat percentage under different dietary treatments ranges from 1.08 % (T₆) to 1.44% (T₁) and differs significantly with the control group. In consonance to our study Eevuri and Putturu¹³ reported the effect of herbal remedies (turmeric, tulsi, amla and aloe-vera) in broiler feed found reduced fat accumulation. Liver stimulating action of amla has been proved to be effective for improving production performance and carcass quality in broilers as stated by Singh *et al.*¹⁶.

Composition of breast meat

Moisture percentage of breast muscles was obtained in range of 71.67% (T₁) to 72.97% (T₃) and significantly higher moisture percentage was recorded in groups supplemented with amla fruit powder. Crude protein percentage of different dietary treatments ranged from 22.47% (T₃) to 22.65 % (T₂) and didn't differ significantly among the supplemented and control group. Fat

percent in all treatment groups ranged from 3.85 % (T₆) to 4.90 (T₁). Fat percentage significantly decreased in amla supplemented groups as compared to control group showing the hypolipidemic effect of amla. In contrary to our study Mehala and Moorthy¹² observed that the abdominal fat percentage, breast and thigh muscle cholesterol in broilers showed no significant difference among treatment groups due to dietary inclusion of herbs and their combination.

Composition of thigh meat

Moisture percentage of thigh muscles under different dietary treatments ranged between 70.03% (T₁) to 71.60 % (T₅). Amla supplemented group T₅, T₆ resulted in significantly higher moisture percentage than the control group. Durrani *et al.*¹⁷ reported that by feeding varying levels of herbal plants extracts to broilers has significant effect on breast weight deposition. Per cent crude protein of thigh muscle ranged from 21.34 % to 21.48% and did not differ significantly among amla supplemented group and control group. Fat percentage of thigh muscles ranged from 6.20 % (T₅) to 7.73 % (T₁). Fat percentage was lowered significantly in amla fruit supplemented as compared to control group showed the hypolipidemic effect of amla. In contrary to our study Mehala and Moorthy¹² observed that the abdominal fat percentage, breast and thigh muscle cholesterol in broilers showed no significant difference among treatment groups due to dietary inclusion of herbs and their combination.

Table 1: Chemical composition of feed ingredients used in ration formulation

Ingredient	CP (%)	CF (%)	EE (%)	TA (%)	Lysine* (%)	Methionine* (%)	ME* (kcal/kg)
Maize	9.11	2.44	3.44	2.25	0.18	0.15	3300
Soybean meal	45.15	3.93	3.16	8.47	2.57	0.76	2230
Fish meal	47.40	1.79	5.16	26.62	1.42	1.42	2210

*Calculated values⁹

Table 2: Ingredient composition of experimental diets during different phases of growth

Ingredient (kg /100 kg of feed)	0-4wks	4-6 wks
Maize	58	60
Soybean meal	30	25
Fish meal	7	7
Vegetable oil	3	6
Mineral mixture	2	2
Feed additivites (g/100 kg feed)		
Spectromix ¹	10	10
Spectromix BE ²	20	20
Veldot ³	50	50
Choline chloride ⁴	50	50
Lysine ⁵	50	50
DL-methionine ⁶	150	150

Composition, sources and rate of mixing of feed additives/supplements

1. Spectromix: Powder (Ranbaxy Animal Health, New Delhi). Each gm. contained Vitamin A-82,500 IU, Vit D3-12000 IU, Vit B2-50 mg and Vit.K-10mg. Mixing rate: 10 g/100Kg of feed.
2. Spectromix BE: Powder (Ranbaxy Animal Health, New Delhi). Each gm. Contained Vit.B1- 8mg, Vit.B6- 16mg, Vit.B12- 80mg, niacin-120mg, calcium pantothenate-80mg, Vit. E-160 mg, Lysine hydrochloride-10 mg, DL-methionine-10 mg and calcium 260 mg. Mixing rate: 20g/100kg of feed.
3. Veldot: Venkeys- Dinitro-O-Toluamide (Coccidiostat). Mixing rate: 50g/100kg of feed.
4. Choline chloride: Contain 60 percent choline. Mixing rate: 50g/100kg of feed.
5. Lysine: Contained 98% lysine. Mixing rate: 50g/100kg of feed.
6. DL-methionine: Contained 98% methionine. Mixing rate: 150g/100kg of feed.

Table 3: Dressed, eviscerated, drawn yield, weight of giblets and abdominal fat of the experimental birds under different dietary treatments

Treatment	Dressed %	Eviscerated %	Drawn %	Liver %	Heart %	Gizzard %	Giblet %	Abdominal fat %
T ₁	77.11±.39	65.35±.44	69.46 ^{ab} ±.38	1.79 ^b ±.05	0.56 ^{ab} ±.02	1.75±.06	4.11 ^b ±.08	1.44 ^a ±.04
T ₂	76.35±.92	64.23±.81	68.59 ^b ±.80	1.89 ^{ab} ±.06	0.55 ^b ±.01	1.91±.05	4.36 ^{ab} ±.15	1.41 ^a ±.05
T ₃	77.19±.47	65.28±.40	69.68 ^{ab} ±.44	1.92 ^{ab} ±.04	0.58 ^{ab} ±.04	1.88±.01	4.39 ^{ab} ±.14	1.36 ^{ab} ±.03
T ₄	77.28±.39	65.49±.45	70.26 ^a ±.50	2.15 ^a ±.01	0.67 ^a ±.07	1.93±.08	4.77 ^a ±.a26	1.23 ^{bc} ±.09
T ₅	77.35±.29	65.49±.28	70.09 ^{ab} ±.32	2.08 ^a ±.06	0.66 ^{ab} ±.02	1.86±.02	4.61 ^a ±.09	1.07 ^c ±.05
T ₆	77.20±.31	65.12±.37	69.56 ^{ab} ±.37	1.94 ^{ab} ±.06	0.68 ^a ±.01	1.80±.00	4.43 ^{ab} ±.06	1.08 ^c ±.02

^{a,b,c} means bearing different superscripts in a column differ significantly (P<0.05)

Table 4: Composition of Breast meat of the experimental birds under different dietary treatments

Treatments	% Moisture	% CP	% EE
T ₁	71.67 ^b ±.20	22.56±.13	4.90 ^a ±.15
T ₂	71.87 ^b ±.34	22.65±.12	4.62 ^a ±.38
T ₃	72.97 ^a ±.15	22.51±.13	3.66 ^b ±.09
T ₄	72.83 ^a ±.25	22.53±.11	3.79 ^b ±.23
T ₅	72.68 ^a ±.10	22.47±.09	3.99 ^b ±.05
T ₆	72.74 ^a ±.07	22.55±.06	3.85 ^b ±.02

^{a,b,c} means bearing different superscripts in a column differ significantly (P<0.05)

Table 5: Composition of thigh meat of the experimental birds under different dietary treatments

Treatments	% Moisture	% CP	% EE
T ₁	70.03 ^b ±.35	21.38±.39	7.73 ^a ±.08
T ₂	70.29 ^b ±.35	21.34±.46	7.51 ^{ab} ±.14
T ₃	70.55 ^b ±.31	21.48±.16	7.11 ^{bc} ±.28
T ₄	70.95 ^{ab} ±.36	21.37±.14	6.82 ^c ±.29
T ₅	71.60 ^a ±.31	21.34±.13	6.20 ^d ±.20
T ₆	71.53 ^a ±.14	21.38±.13	6.22 ^d ±.04

^{a,b,c} means bearing different superscripts in a column differ significantly (P<0.05)

CONCLUSION

Herbs, spices and various plant extracts have received increased attention as possible antibiotic growth promoter replacements. In this view, the plants identified with properties of secondary metabolites became interesting due to their antimicrobial, antioxidant effects and their stimulating effects on animal performance and digestive enzymes. Our study revealed that data on carcass parameters in terms of dressed, eviscerated, and drawn yield revealed no significant differences among the groups. Fat percentage significantly decreased in amla supplemented groups as compared to control group showing the hypolipidemic effect of amla.

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