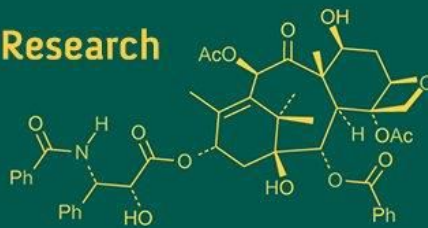


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; SP-10(4): 400-404
www.biochemjournal.com
Received: 24-01-2026
Accepted: 28-02-2026

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Effect of feeding graded levels of coriander seed powder on carcass traits and sensory evaluation of meat of broiler chickens

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DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i4Se.8131>

Abstract

The present study was carried out to examine the incorporation of coriander seed powder (CSP) in broiler ration on carcass traits and organoleptic evaluation of broiler meat. A total of 240 broiler chicks (day old, Cobb strain) were randomly divided to five dietary groups (48 birds/group). The control group (C) was fed basal diet, whereas in treatment groups, CSP was incorporated @ 1%, 2%, 3% and 4% levels and designated as T₁, T₂, T₃, and T₄, respectively. The diets formulated were isocaloric and isonitrogenous. Results of carcass traits revealed significantly higher ($p < 0.05$) values in terms of bled weight (g), defeathered weight (g), viscera weight (g) and eviscerated weight (g) in T₂ group as compared to control (C), while the carcass traits on% live weight basis revealed no significant difference ($p > 0.05$) between groups. The outcome of sensory traits in terms of flavour and acceptability were significantly ($p < 0.05$) improved in CSP fed groups, while results of colour, texture and juiciness revealed non-significant difference ($p > 0.05$) between treatments. Therefore, it could be concluded that dietary incorporation of CSP in broiler ration has no negative effect on the carcass characteristics and overall sensory attributes of broiler chicken meat, moreover it enhances the quality of carcass and the flavour of meat.

Keywords: Broiler, carcass traits, coriander seed powder, feed additive, sensory evaluation

Introduction

Coriander (*Coriandrum sativum*) is a widely recognized aromatic and medicinal plant which is found not only in wild, but also cultivated across India (Taha *et al.*, 2019) [22]. It belongs to the Umbelliferae family, has a broad geographical presence, with its origins traced back to the Mediterranean and Middle Eastern regions (Samojlik *et al.*, 2010) [15]. It is widely cultivated in various regions, including Netherlands, Central and Eastern Europe, the Mediterranean countries (such as Morocco, Malta and Egypt), as well as in South-Asian countries (China, India and Bangladesh) (Pathak *et al.*, 2011; Laribi *et al.*, 2015) [13, 9]. This herb harnessed the label "spice of happiness" in Egyptian culture, which is attributed to its aphrodisiac property (Burdock and Carabin, 2009) [2]. In India, coriander is primarily found in states like Madhya Pradesh, Maharashtra, Rajasthan, Andhra Pradesh, Tamil Nadu, Karnataka, and Bihar (Shivanand, 2010) [18]. Over millennia, coriander has been well-known in Asian nations for its various applications and uses (Masood *et al.*, 2006) [10].

These coriander seed powder (CSP) act as appetite enhancer, digestive stimulant and carminative, in addition to their other bioactive properties. Thus, it has gained attention for its potential benefits in poultry diets. It is rich in vitamins (niacin, riboflavin and thiamine) and minerals (iron, calcium and magnesium) in addition to valuable essential oils and polyunsaturated fatty acids (Sahib *et al.*, 2013) [14]. The leaves, seeds and essential oils of coriander have demonstrated a significant antimicrobial effect against both gram-positive and gram-negative microorganisms (Silva and Domingues, 2017) [19]. The use of coriander seed powder as an alternative to antibiotic growth promoters (AGPs) has been recommended for feeding broilers in past studies (Taha *et al.*, 2019; Gazwi *et al.*, 2022; Siyag *et al.*, 2024) [22, 5, 20]. These studies have indicated that dietary coriander can lead to improvements in growth and carcass traits. The aim of the present study is to investigate the effect of feeding graded levels of CSP on the carcass traits and sensory evaluation of meat of broiler chickens.

Materials and Methods

Experimental birds, design and ethics approval: The trial was carried out at the Poultry Shed of the Faculty of Veterinary Sciences and Animal Husbandry, SKUAST-J, Jammu & Kashmir, India. A total of 240 unsexed, day-old broiler chicks (Cobb-400 commercial strain) of uniform hatch were procured from a reputed commercial hatchery (Venkys™). Chicks were allocated to five groups (48 chicks/group) namely C, T₁, T₂, T₃, and T₄ groups, which were reared under standard brooding and management conditions. The experiment was conducted using a Completely Randomized Design. The birds were handled as per approved trial protocol regulations of Institutional Animal Ethics Committee (IAEC), SKUAST-Jammu.

Feeding of experimental birds: On arrival of chicks, the birds were offered electrolytes through oral route (drinking water) to check the transportation stress and dehydration. Also, to facilitate the early feed intake as well as recognition, a weighed quantity of familiar feed was scattered over the newspapers in addition to chick feeders and chick feeding trays. The nutrient requirement of broilers were met as per the Indian Council of Agricultural Research (ICAR, 2013) [7] guidelines. The C group was fed a standard basal diet without CSP, whereas in T₁, T₂, T₃, and T₄ groups, basal diet was incorporated with 1%, 2%, 3%, and 4% CSP, respectively. The ingredients used in preparation of basal diet are maize flakes, soybean meal, meat-cum-bone meal, soybean oil, mineral and vitamin premixes, common salt, sodium bicarbonate, DL-methionine and L-lysine hydrochloride.

Carcass traits: A total of 40 birds (8 birds/group) were randomly chosen for slaughter. The birds were off fed for whole night (12-14 hours) prior to slaughter. After taking the live weight, the birds were humanely sacrificed following the *Halal* procedure, allowing the blood to drain for 1-2 minutes. The carcasses were defeathered and again weighed. It was followed by decapitation, removal of legs at the hock joint, and evisceration. Measurements were taken for various carcass traits, including live weight, bled weight (post-jugular severing), carcass weight, and viscera weight (internal organs), with all values recorded in grams and expressed as a percentage of live weight. Dressing percentage was computed by dividing the sum of the eviscerated carcass weight and giblet weight by the live weight and expressing the result as a percentage.

Sensory evaluation: For the organoleptic evaluation, the

dressed meat obtained post-slaughter (same cuts) was thoroughly cleaned and cooked in boiling water for 10-15 minutes. Sensory attributes were judged by a semi-trained panel of experienced evaluators from the Faculty of Veterinary Sciences and Animal Husbandry, comprising Assistant and Associate Professors. The assessment followed an eight-point descriptive scale (Semen *et al.*, 1987) [16], where a score of eight indicated extremely desirable quality and a score of one reflected highly unsatisfactory quality. Each panellist received a self-explanatory individual proforma for scoring and was seated in a well-lit, odour-free, and quiet faculty room. The evaluated sensory parameters included appearance, flavour, juiciness, texture, and overall acceptability.

Statistical analysis: The data generated in the experiment were statistically analysed using one-way ANOVA as per the procedure outlined by Snedecor and Cochran (1994) [21]. Treatment means were compared through Duncan's multiple range test (DMRT), with statistical significance considered at $p < 0.05$.

Results

Carcass characteristics: The carcass traits of adult broiler chicken (assessed at 42 days age) are depicted in Table 1, while the carcass traits as% live weight is presented in Figure 1. The live weight (g; LW) was found higher ($p < 0.05$) in T₁ and T₂ than C, but T₃ has no difference with T₁, T₂ and T₄, whereas the LW of T₄ birds lies in between C and T₃. The dressing percentage for groups C, T₁, T₂, T₃ and T₄ were assessed and remained statistically comparable ($p > 0.05$) across the treatments. The bled weight (kg) was recorded significantly higher ($p < 0.05$) in T₁, T₂ and T₃ groups in comparison to C and T₄ groups. But bled weight (as% LW) showed no difference. Like bled weight trend, defeathered weight (kg) was observed higher up to 3% CSP fed groups, but its computation as% LW showed similar values.

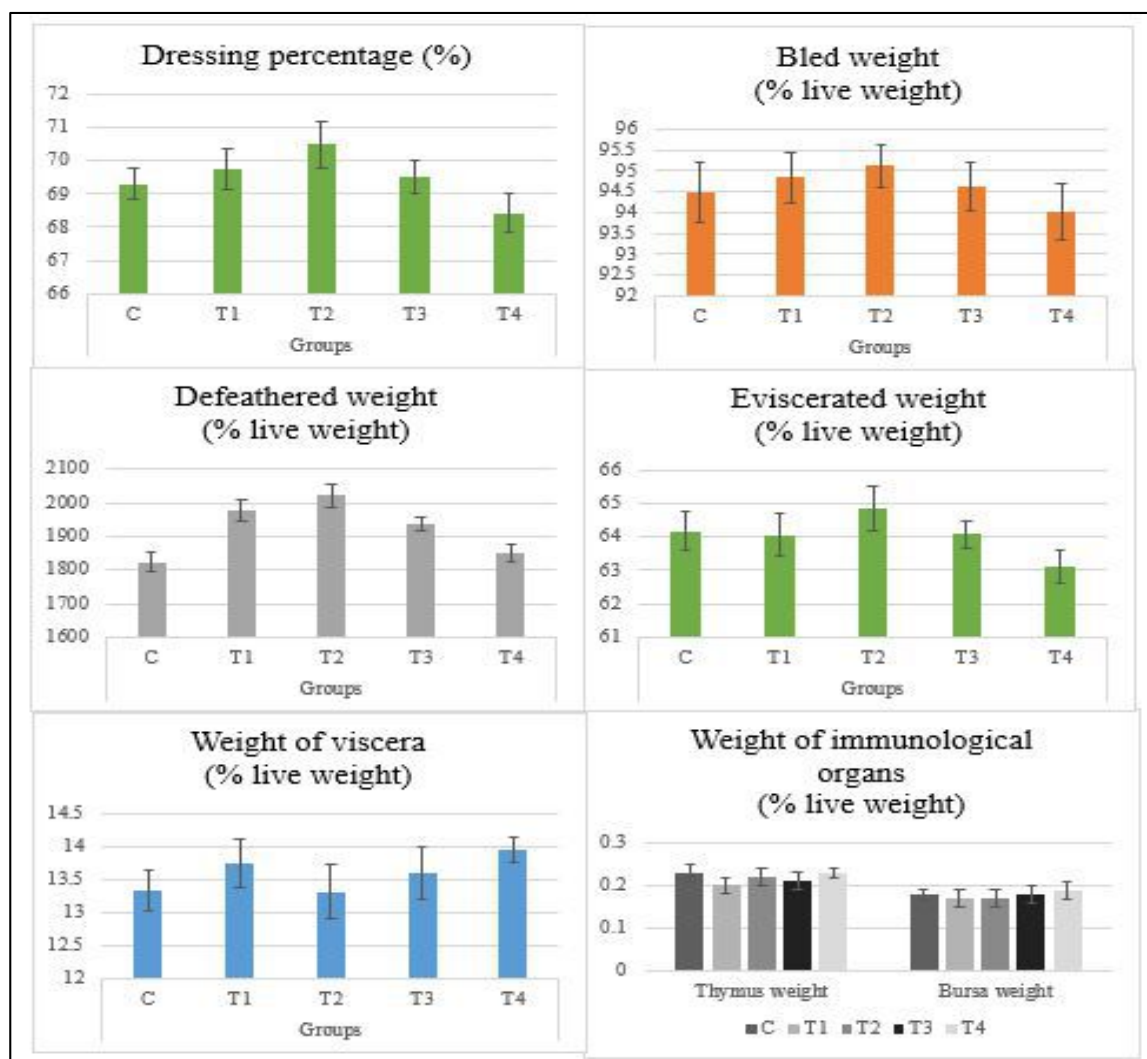
The weight of viscera (g) was found higher ($p < 0.05$) in CSP fed groups T₁, T₂, T₃ and T₄ compared to control. Whereas the eviscerated weight (g) was observed higher in T₁ and T₂ than C and T₄, however T₃ group had intermediate eviscerated weight. The giblet weight (g) was found significantly higher ($p < 0.05$) in T₁ and T₂ than C, however intermediate weights were seen in T₃ and T₄ groups. But no difference was seen when the above-mentioned traits are expressed as% LW. Also, the weight of immunological organs in grams as well as% LW showed no change irrespective of different dietary treatments.

Table 1: Carcass characteristics (in grams) of broiler chickens fed graded levels of coriander seed powder

Particulars	Groups					SEM	p-value
	C	T ₁	T ₂	T ₃	T ₄		
Live weight (g)	2353.66 ^a	2541.32 ^c	2585.31 ^c	2495.65 ^{bc}	2403.18 ^{ab}	21.32	0.001
Bled weight (g)	2222.63 ^a	2409.88 ^b	2458.50 ^b	2360.25 ^b	2258.75 ^a	19.95	0.000
Defeathered weight (g)	1824.28 ^a	1977.38 ^b	2020.88 ^b	1937.13 ^b	1851.88 ^a	17.3	0.000
Weight of viscera (g)	313.47 ^a	348.66 ^b	343.52 ^b	338.57 ^b	335.25 ^b	3.25	0.003
Eviscerated weight (g)	1510.81 ^a	1628.71 ^b	1677.36 ^b	1598.55 ^{ab}	1516.62 ^a	16.57	0.001
Weight of immunological organs							
Thymus weight (g)	5.38±0.56	5.02±0.50	5.56±0.38	5.28±0.35	5.55±0.25	0.18	0.891
Bursa weight (g)	4.33±0.25	4.20±0.42	4.36±0.40	4.39±0.36	4.44±0.37	0.15	0.993

^{a,b,c}Mean with different superscript within row differs significantly ($p < 0.05$)

C, T₁, T₂, T₃ and T₄ groups: Coriander seed powder was incorporated in broiler ration @ 0, 1, 2, 3 and 4%, respectively



C, T₁, T₂, T₃ and T₄ groups: Coriander seed powder was incorporated in broiler ration @ 0, 1, 2, 3 and 4%, respectively

Fig 1: Dressing percentage and carcass traits (% live weight) of broiler chickens fed graded levels of coriander seed powder

Sensory evaluation: At the end of the trial, meat samples from all broiler groups were uniformly boiled for 20 minutes without the use of any spices and assessed for various sensory attributes including colour, flavour, texture, juiciness, and overall acceptability. The results, presented in Table 2, showed sensory scores ranging between 6.60 to 7.20 for colour, 7.00 to 7.40 for texture and 6.60 to 7.40 for juiciness, with no statistically significant differences

observed. However, flavour score was observed statistically higher in T₃ and T₄ than C, but T₁ and T₂ had intermediate flavour scores. Likewise, a similar trend was seen in overall acceptability in which C had the lowest score while as T₃ and T₄ had the highest score, however T₁ and T₂ had in between scores. These findings suggest that the inclusion of CSP in broiler diets, up to a level of 4%, did not negatively influence the sensory quality of the meat.

Table 2: Effect of coriander seed powder inclusion on sensory attributes of broiler meat

Attributes	Groups					SEM	p-value
	C	T1	T2	T3	T4		
Colour	6.60	6.80	6.80	7.20	7.00	0.13	0.707
Flavour	6.20 ^a	7.20 ^{ab}	7.20 ^{ab}	7.60 ^b	7.80 ^b	0.18	0.040
Texture	7.00	7.20	7.20	7.40	7.00	0.14	0.901
Juiciness	6.60	7.00	7.00	7.40	7.20	0.19	0.765
Overall acceptability	6.20 ^a	7.00 ^{ab}	7.00 ^{ab}	7.80 ^b	7.40 ^b	0.17	0.033

^{a,b}Mean with different superscript within row differs significantly ($p < 0.05$).

C, T₁, T₂, T₃ and T₄ groups: Coriander seed powder was incorporated in broiler ration @ 0, 1, 2, 3 and 4%, respectively.

Discussion

The carcass traits of broiler chickens were assessed after the trial completion to evaluate the effect of feeding graded levels of CSP on the dressing percentage and different carcass characteristics. In agreement with the present results, earlier authors documented no viable change in carcass traits on feeding CSP at varying inclusion levels (El-

Shoukary *et al.*, 2014; Naemasa *et al.*, 2015; Al-Zuhairi *et al.*, 2017; Gurram *et al.*, 2022; Meradi *et al.* 2022; El-Gogary *et al.*, 2024) [4, 12, 1, 6, 11, 3]. Similarly, Khubeiz and Shirif, (2020) [8] also reported no change in dressing percentage (%) with skin, heart, liver and gizzard weights (g) on feeding different levels of CSP. No change in relative weight of carcass traits signifies proportional growth with

overall body size rather than disproportionate organ development. Also, the weight of immunological organs in grams as well as % LW showed no change irrespective of different dietary treatments. The lengths of duodenum, jejunum and ileum also showed no viable difference ($p > 0.05$). It was inferred that CSP feeding had no effect on above mentioned carcass traits. No change in relative weights of spleen and bursa was reported by El-Gogary *et al.* (2024) [3] on 3, 5 and 7% CSP feeding to broilers. Likewise, Gurram *et al.* (2022) [6] noticed no change in bursa and thymus weights on feeding broilers with diet containing 0.5 and 1.0% CSP, but in 2% CSP fed group, higher bursa and thymus weights were noted. But Taha *et al.* (2019) [22] noted a significant increase in bursa and thymus weights in 0.4% CSP fed group. But these results depicted that CSP inclusion had no negative influence on the carcass traits.

The sensory attributes of broiler meat *viz.* color, texture and juiciness exhibited no adverse effects on CSP inclusion in broiler diet. However, flavour and overall acceptability were positively influenced with the graded increase in CSP inclusion. The results of the present study corroborate the findings of Shitole *et al.* (2023) [17], who detected significant improvements in juiciness and overall acceptability in CSP-fed broilers. The improvement in sensory perception in CSP-fed groups may be attributed to bioactive phytochemicals (essential oils) present in CSP, which have antioxidant and antimicrobial properties (Silva *et al.*, 2020) [19]. Furthermore, these compounds also maintain meat freshness, halt oxidative deterioration, and modulate flavor profile, which adds up to improving consumer acceptability. The literature pertaining to sensory traits evaluation on CSP feeding is not available, so the results cannot be discussed. The enhancement in overall acceptability at higher CSP levels suggests a probable synergistic effect of flavor-enhancing volatiles and improved meat quality traits.

Conclusion

The incorporation of coriander seed powder up to 4% in broiler ration had no adverse effect on carcass traits, however, the results were best at 2% inclusion. Moreover, the inclusion of coriander seed powder also improved the organoleptic attributes of broiler meat. Thus, it could be concluded that inclusion of 2% coriander seed powder in the diet of broiler chicken is beneficial to improve the quality of carcass and also to enhance the flavour of broiler meat.

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