Influence of Phytoadditives on body weight and carcass traits of Layer Quail

G. Kour[1], N. Khan[2], R.K. Sharma[1], V. Mahajan[2], Z.F. Bhat[3], J.S. Sasan[4]

[1]Division of Animal Nutrition, [2]Division of LFC, [3]Division of LPT, [4]Division of Veterinary Anatomy, Faculty of Veterinary Sciences & Animal Husbandry, Sher-E-Kashmir University of Agricultural Sciences & Technology of Jammu, R.S. Pura
*Corresponding author: nazamdrkhan@gmail.com

Journal of Livestock Science (ISSN online 2277-6214) 16: 287-292
Received on 3/1/25; Accepted on 25/3/25; Published on 30/3/25
doi. 10.33259/JLivestSci.2025.287-292

Abstract

In order to evaluate the effect of supplementation of different phytoadditives over the body weight change and carcass characteristics of layer quails, 360 birds of same hatch (6 weeks old) were randomly distributed into eight groups (n=45), having three replicas of fifteen quail layers per replica. These eight dietary groups were: Negative control (NC; maize-soya based diet with no additive), positive control (PC; herbal growth promoter-Reproforte plus™ was supplemented @ 500gm per ton feed), whereas T_1, T_2, T_3, T_4, T_5 and T_6 groups were supplemented with 1% dietary additive namely turmeric, garlic, fenugreek, cumin, *aloe vera* and oregano powder, respectively. These additives were fed consecutively for 22 weeks. Results of body weight change (g) showed no difference ($P>0.05$) amongst different dietary groups. Also, carcass traits revealed similar values irrespective of different dietary treatments. But the sensory attributes of layer quail meat revealed that color and appearance were significantly better in T_3, T_4, T_5 and T_6 than NC, whereas PC, T_1 and T_2 have intermediate values. Although, flavor, texture and juiciness were similar but the overall acceptability was found better in PC, T_3, T_4, T_5 and T_6 than NC group with intermittent values for rest of the groups. It may be concluded that phytoadditives supplementation may improve the sensory attributes of layer quail meat.

Key words: Quail layer; Phytogenic feed additives; Body weight; Carcass traits.

Introduction

Phytoadditives, also called herbal additives, are the group of natural growth promoters, which can be used to replace antibiotic growth promoters in poultry diet (Chowdhary et al., 2021). These additives have plant origin which are derived from herbs, spices and other plants besides their extracts and possess a range of bioactive properties *viz.* anti-oxidant, anti-microbial, anti-viral, anti-inflammatory, immuno-stimulant (Gupta et al., 2022) which are attributed to the active principles present in them such as alkaloids, bitters, flavonoids, glycosides, mucilage, saponins, tannins phenolics, polyphenols, terpenoids, polypeptide, thymol, cineole, linalool, anethole, allicin, capsaicin, allylisothiocyanate, piperine . These additives have positive impact on animal's digestive systems or growth-stimulating mechanisms and bear one or a combination of properties and have garnered a lot of attention recently (Granados-Chinchilla, 2017). Compared to prophylactic antibiotics, these natural feed additives are not harmful, residue-free, non-toxic and may promote the effective use of feed nutrients, promoting production rates and feed efficiency (Chowdhary et al., 2022).

Quail (*Coturnix coturnix japonica*) is one of the economically important avian species, which is immunologically more potent and comparatively resistant to environmental constraints (ICAR, 2013). It possess characteristics of fast growth, early sexual maturity and high rate of egg production. Thus, they are gaining importance as diversified poultry species to augment meat and egg production. Its meat fetches more price, contains less fat and cholesterol (Boni et al., 2010) and has reasonable demand in market by calorie conscious people (Khalifa et al., 2016). Due to less space requirement (0.2 sq ft/bird) and lower initial investment, quails can be easily raised as a commercial enterprise (Arunrao et al., 2023). In India, Quail farming is a growing industry, and has relatively higher profit margins (Pandian et al., 2017).

Although, quails don't need medication, but supplementation of phytogenic feed additives in their diet may improve their general health and production performance (Bauer et al., 2019). Researchers in the past have used Aspilia africana (Oko et al, 2016), Nigella sativa seeds (Shokrollahi & Sharifi, 2018), Heracleum persicum and Echinacea angustifolia (Angas et al, 2018), Turmeric rhizome powder (Kennedy et al 2019) for promoting growth of Japanese Quail. Some other used phytoadditives with their active principles are Garlic (allicin), Fenugreek (neurin, biotin, trimethylamine), Cumin (cuminaldehyde, anthraquinone, coumarin), *Aloe vera* (acemannan) and Oregano (thymol and carvacrol). Majority of these phytoadditives are appetite enhancer, gastric/digestive stimulant and have carminative action besides other properties, which can be exploited to enhance the performance of quails. With this background, a study has been carried out to select an outright phytoadditive by evaluating the body weight change and carcass traits of layer quails.

Materials and methods

The present trial was carried out during summer at Division of Animal Nutrition, Faculty of Veterinary Sciences and Animal Husbandry, SKUAST-Jammu, India bearing 32.6049º N latitude, 74.7315º E longitude. Three hundred sixty Japanese quail (*Coturnix coturnix japonica*) layers of same hatch (6 weeks old) were randomly distributed into eight groups (n=45), having three replicas of fifteen quail layers per replica. A maize-soya based basal diet for layer quails was formulated as per specifications given by ICAR (2013) (Table 1). The eight dietary groups were: Negative control group contains no additive, positive control is supplemented with commercial growth promoter (Reproforte plus™ containing *Adhatodavasica*- 20%, *Asparagus officinalis*- 15%, *Leptadenia reticulate*- 15%, *Zingiber officinalis*- 10%, *Rubia cordiolia*- 10%, *Tribulus terrestris*- 10%, *Solena amplexicaulis*- 10%, *Punica granatum*- 10% and was supplemented @ 500 gm per ton feed, supplied by Arvind Herbal Labs, Saharanpur, UP), whereas T_1, T_2, T_3, T_4, T_5 and T_6 groups were supplemented as 1% dietary additive with turmeric, garlic, fenugreek, cumin, *aloe vera* and oregano powder, respectively. All the phytoadditives used except *aloe vera* powder were purchased raw from local market. These were dried and grinded to powder form before mixing in the basal feed whereas *Aloe vera* powder was bought from AMORVET, UK, India. The layer birds were weighed at the start of the experiment and thereafter monthly for determining body weight change. At the end of twenty-two weeks feeding trial, three birds per replica were slaughtered to assess the carcass characteristics *viz.* live weight, Slaughter weight, Carcass weight, Dressing percentage, Viscera weight, Giblet weight (heart, liver, gizzard weight), Spleen weight and were expressed as percent of live weight also. The dressed meat obtained after slaughter was washed thoroughly and boiled in hot water for 10-15 minutes for sensory evaluation. The sensory evaluation was done in a well illuminated room by an expert panel by means of eight-point descriptive scale (Semen et al., 1987), where eight signified extremely desirable and one represent extremely poor. The sensory attributes were evaluated on the basis of color, appearance, flavor, juiciness, texture and overall acceptability.

Table 1: Ingredient and chemical composition (%) of layer quail diet

Attributes	Ingredient composition (%)
Maize	62.66
Meat bone meal	4.02
Soybean meal	24.65
Salt	0.25
Sodium bicarbonate	0.01
Soybean oil	1.30
DL-Methionine	0.10
L-Lysine hydrochloride	0.12
Limestone powder	6.72
Vitamin supplement	0.05
Trace minerals	0.10
Chemical composition (on DMB, %)	
Organic Matter	95.31
Crude Protein	18.62
Ether Extract	5.51
Crude Fibre	4.19
Total Ash	4.69
Nitrogen free extract	66.99
ME (Kcal/kg; calculated value)	2850

Statistical analysis

The data pertaining to different parameters were subjected to statistical analysis as per Snedecor and Cochran (1994). The means in different treatments were subjected to Duncan's multiple range test (1995) for ranking ($P<0.05$).

Results and Discussion

Results of the body weight and body weight change (g) revealed no effect of phytoadditives supplementation ($P>0.05$) in layer quail (Table 2 and 3). Similar to our findings, Chongtham et al. (2015) reported no effect of fenugreek supplementation on the body weight and body weight change in layer quails. Likewise, several researchers reported no body weight change in laying hens and body weight of layer quails on supplementing turmeric, garlic and fenugreek at different levels (Ghosh et al., 2020).

The results of phytoadditives (PFA) supplementation on carcass characteristics are presented in Table 4. It was found that live weight of the layer quails selected for slaughter has statistically similar values irrespective of supplementing different phytoadditives. Similarly, slaughter weight, carcass weight (in g as well as % of live weight) was not statistically influenced by addition of phytoadditives in the layer quail diet. In accordance with our observations, Kichloo et al. (2023) reported no effect of aloe vera powder supplementation on the live weight, slaughter weight and carcass weight of meat quail birds. A non-significant difference was also found for de-feathered weight, viscera weight and eviscerated weight in different treatment groups in the current study.

The dressing percentage (%) of layer birds also showed similar values ($P>0.05$) on feeding different phytoadditives. The present results corroborate with the findings of Hossen et al. (2018), who also found no difference in dressing percentage of meat quail birds on 0.5, 1.5 and 2.5% turmeric supplementation as dietary additive. Earlier researchers too stated similar dressing percentage on *aloe vera* supplementation in poultry birds (Arif et al., 2022).

The weight of heart, liver, gizzard and spleen in grams and as % live weight were statistically similar in all the treatment groups. The results are in line with Ashayerizadeh et al. (2023) who too reported that turmeric powder supplementation did not affect the weight of liver and spleen of the Japanese quail birds. Likewise earlier researcher too found similar giblet weight on supplementation of garlic and turmeric powder alone or in combination (Mondal et al., 2015). In contrast, Brzoska et al. (2015) observed decrease in the liver weight of garlic supplemented groups. No effect of fenugreek and *aloe vera* supplementation on weight of heart, liver, and gizzard was observed in quail birds by earlier researcher (Kichloo et al., 2023). On the contrary, heart and liver weight of Japanese quail receiving 50 mg/kg oregano oil were significantly higher compared to treatment groups receiving 0, 100, 200 and 400 mg/ kg oregano oil in the diet (Badiri and Saber, 2016).

Different sensory parameters *i.e.* appearance, flavor, juiciness, texture and overall acceptability were assessed in layer quail meat after 22 weeks of laying cycle and results obtained are summarized in Table 5. No

Table 2: Effect of phytoadditives supplementation on body weight of layer quail

Groups	Body weight (g)					
	Day 0	Day 30	Day 60	Day 90	Day120	Day150
NC	188.69	194.70	200.51	205.66	209.4	212.57
PC	190.21	196.26	203.05	208.74	213.44	217.18
T_1	191.25	196.89	204.05	210.21	214.72	218.18
T_2	187.35	194.19	202.51	208.81	214.42	219.25
T_3	186.51	193.75	201.36	207.43	212.24	215.89
T_4	187.05	194.76	201.55	207.47	211.69	215.75
T_5	188.31	195.52	201.76	207.88	212.47	216.80
T_6	187.97	193.78	199.05	205.33	210.58	215.33
SEM	0.86	0.90	0.88	0.91	0.90	0.86
P-value	0.919	0.991	0.942	0.935	0.87	0.743

Negative control (NC; contains no additive), positive control (PC; herbal growth promoter- Reproforte plus™ was supplemented @ 500gm per ton feed), whereas T_1, T_2, T_3, T_4, T_5 and T_6 groups were supplemented with 1% dietary additive namely turmeric, garlic, fenugreek, cumin, *aloe vera* and oregano powder, respectively.

Table 3: Effect of phytoadditives supplementation on body weight change of layer quail

Groups	Body weight change **(g)**				
	P_1	P_2	P_3	P_4	P_5
NC	6.01	5.81	5.15	3.74	3.18
PC	6.05	6.79	5.70	4.70	3.74
T_1	5.63	7.16	6.17	4.51	3.46
T_2	6.84	8.31	6.31	5.61	4.83
T_3	7.23	7.61	6.07	4.82	3.65
T_4	7.71	6.79	5.92	4.23	4.06
T_5	7.21	6.24	6.12	4.59	4.33
T_6	5.81	5.27	6.29	5.25	4.75
SEM	6.56	6.75	5.96	4.68	4.00
P-value	0.64	0.29	0.98	0.92	0.51

P_1 (Body wt 0 to 30 days), P_2 (Body wt 30 to 60 days), P_3 (Body wt 60 to 90 days), P_4 (Body wt 90 to 120 days) and P_5 (Body wt 120 to 150 days). Negative control (NC; contains no additive), positive control (PC; herbal growth promoter- Reproforte plus™ was supplemented @ 500gm per ton feed), whereas T_1, T_2, T_3, T_4, T_5 and T_6 groups were supplemented with 1% dietary additive namely turmeric, garlic, fenugreek, cumin, *aloe vera* and oregano powder, respectively.

Table 4: Effect of phytoadditives supplementation on carcass characteristics of layer quail

ATTRIBUTES	Groups								SEM	P-value
	NC	PC	T_1	T_2	T_3	T_4	T_5	T_6		
Live weight(g)	210.18	211.37	218.96	212.04	215.65	219.00	216.50	218.25	1.59	0.769
Bled weight(g)	203.61	203.35	208.58	205.49	209.01	214.3	209.61	212.53	1.70	0.730
% of live weight	96.87	96.17	95.26	96.89	96.91	97.84	96.83	97.36	0.20	0.050
De-feathered weight without skin (g)	166.55	166.67	172.91	163.49	166.82	169.35	166.44	167.80	1.41	0.892
% of live weight	79.28	78.92	78.98	77.11	77.27	77.28	76.92	76.93	0.43	0.713
Eviscerated weight (g)	135.42	139.40	142.72	138.09	138.54	141.41	139.94	142.76	0.93	0.530
% of live weight	64.46	66.04	65.17	65.17	64.27	64.63	64.69	65.46	0.36	0.959
Viscera weight (g)	31.13	27.27	30.19	25.40	28.29	27.94	26.50	25.04	1.19	0.923
% of live weight	23.09	19.54	21.42	18.37	20.33	19.80	18.89	17.59	0.88	0.876
Dressing %	70.69	71.50	71.58	71.47	70.66	70.23	70.32	71.51	0.38	0.972
Giblet weight (g)	13.12	11.64	14.06	13.30	13.76	12.23	12.18	13.24	0.31	0.511
% of live weight	9.68	8.32	9.84	9.67	9.94	8.65	8.71	9.28	0.22	0.431
Heart weight (g)	1.54	1.67	1.82	1.71	1.78	1.68	1.77	2.01	0.05	0.514
% of giblet weight	1.13	1.19	1.27	1.23	1.29	1.19	1.26	1.41	0.03	0.635
Gizzard weight (g)	5.93	5.25	6.04	5.09	6.02	5.45	5.53	6.07	0.16	0.673
% of giblet weight	4.38	3.75	4.24	3.69	4.35	3.86	3.94	4.25	0.11	0.637
Liver weight (g)	5.64	4.72	6.21	6.51	5.97	5.18	4.89	5.15	0.22	0.350
% of giblet weight	4.16	3.37	4.33	4.75	4.31	3.60	3.51	3.62	0.16	0.297
Spleen weight (g)	0.44	0.50	0.43	0.42	0.40	0.40	0.40	0.40	0.01	0.503
% of live weight	0.33	0.36	0.30	0.30	0.29	0.28	0.28	0.28	0.01	0.544

Negative control (NC; contains no additive), positive control (PC; herbal growth promoter- Reproforte plus™ was supplemented @ 500gm per ton feed), whereas T_1, T_2, T_3, T_4, T_5 and T_6 groups were supplemented with 1% dietary additive namely turmeric, garlic, fenugreek, cumin, *aloe vera* and oregano powder, respectively.

Table 5: Effect of phytoadditives supplementation on sensory attributes of spent layer quail meat.

Groups	Attributes				
	Color & Appearance	Flavor	Texture	Juiciness	Overall acceptability
NC	5.40^{a}	5.75	6.50	6.00	5.75^{a}
PC	6.08^{ab}	6.50	7.00	6.75	6.58^{bcd}
T_1	6.42^{ab}	6.50	7.00	6.58	6.42^{abc}
T_2	6.42^{ab}	5.67	6.83	6.33	6.17^{ab}
T_3	6.83^{b}	6.50	7.33	6.50	6.75^{bcd}
T_4	7.00^{b}	6.83	7.00	6.75	7.25^{d}
T_5	7.00^{b}	6.83	6.83	6.58	7.17^{d}
T_6	7.00^{b}	6.83	7.00	6.33	6.92^{cd}
SEM	0.14	0.12	0.08	0.09	0.10
P-value	0.03	0.05	0.41	0.39	0.00

Negative control (NC; contains no additive), positive control (PC; herbal growth promoter- Reproforte plus™ was supplemented @ 500gm per ton feed), whereas T_1, T_2, T_3, T_4, T_5 and T_6 groups were supplemented with 1% dietary additive namely turmeric, garlic, fenugreek, cumin, *aloe vera* and oregano powder, respectively.

significant difference was observed in flavor, juiciness, body and texture in all the dietary groups. However, better color, appearance and overall acceptability was observed in PC, T_3, T_4, T_5 and T_6 treatment groups ($p < 0.05$) with lowest value for the NC group whereas, rest of the groups showed intermediate values. Literature pertaining to effect of phytoadditives supplementation on layer quail meat is not available to the best of our knowledge, so the results cannot be discussed.

Conclusion

It may be concluded that phytoadditives supplementation namely fenugreek, cumin, *aloe vera* and oregano powder as 1% dietary additive and herbal growth promoter improved the overall acceptability on sensory evaluation of layer quail meat.

Acknowledgement

The authors extended their gratitude to the Vice-Chancellor, SKUAST-Jammu for providing necessary amenities to accomplish the study.

References

1) Angas MR, Tabrizi HM, Pourelmi M, Abdollahi M, 2018. Effect of the Heracleum persicum and Echinacea angustifolia levels on performance in of male Japanese quail. Journal of Livestock Science 9: 96-100
2) Arif, M., UR Rehman, A., Naseer, K., Abdel-Hafez, S.H., Alminderej, F.M., El-Saadony, M.T., Abd El-Hack, M.E., Taha, A.E., Elnesr, S.S., Salem, H.M. and Alagawany, M. 2022. Effect of aloe vera and clove powder supplementation on growth performance, carcass and blood chemistry of Japanese quails. Poultry Science. 101(4):101702.
3) Arunrao KV, Kannan D, Amutha R, Thiruvenkadan AK, Yakubu A, 2023. Production performance of four lines of Japanese quail reared under tropical climatic conditions of Tamil Nadu, India. Frontier in Genetics, 14:1128944.
4) Ashayerizadeh O, Dastar B, Shargh MS, Soumeh EA, Jazi V, 2023. Effects of black pepper and turmeric powder on growth performance, gut health, meat quality, and fatty acid profile of Japanese quail. Frontiers in Physiology 14:1218850.
5) Badiri R, Saber SN, 2016. Effects of dietary oregano essential oil on growth performance, carcass parameters and some blood parameters in Japanese male quail. International Journal of Pure and Applied Bioscience 4(5):17-22.
6) Bauer BW, Gangadoo S, Bajagai YS, Van TTH, Moore RJ, Stanley D, 2019. Oregano powder reduces *Streptococcus* and increases SCFA concentration in a mixed bacterial culture assay. PLoS ONE 14(12): e0216853.

7) Boni I, Nurul H, Noryati I, 2010. Comparison of meat quality characteristics between young and spent quails. International Food Research Journal, 17: 661-666.
8) Brzóska F, OEliwiñski B, Michalik-Rutkowska O, OEliwa J, 2015. The effect of garlic (*Allium sativum* L.) on growth performance, mortality rate, meat and blood parameters in broilers. Annals of Animal Science 15: 961-975.
9) Chongtham S, Tyagi PK, Mandal AB, Rokade JJ, Singh S, 2015. Effect of dietary inclusion of fenugreek (*Trigonella foenum-graecum L.*) and black cumin (*Nigella sativa L.*) on performance, egg quality traits and egg yolk cholesterol in laying Japanese quails. Indian Journal of Poultry Science 1:42-47.
10) Chowdhary S, Khan N, Sharma RK, Sasan JS, Mahajan V, 2021. Effect of dietary inclusion of turmeric (*Curcuma longa*) and garlic (*Allium sativum*) powders as feed additives on performance of broiler chicken. Indian Journal of Animal Nutrition 38(1):92-99.
11) Choudhary S, Khan N, Sharma RK, Sasan JS, Mahajan V, 2022. Effect of dietary inclusion of turmeric (*Curcuma longa*) and garlic (*Allium sativum*) powders as feed additives on growth performance and cell mediate immune response of broiler chicken. International Journal of Bio-resource and Stress Management 13(10):1040-1046.
12) Duncan DB, 1995. New Multiple Range and Multiple Test. Biometrics 11: 1-42.
13) Ghosh T, Kumar A, Sati A, Mondal BC, Singh SK, Kumar R, 2020. Effect of dietary supplementation of herbal feed additives (black cumin, garlic and turmeric) in combination with linseed oil on production performance of white leghorn laying chickens. Journal of Entomology and Zoology Studies 8(6):478-482.
14) Granados-Chinchilla F, 2017. A review on phytochemicals (including essential oils and extracts) inclusion in feed and their effects on food producing animals. Journal of Dairy and Veterinary Science 3(4):555620.
15) Gupta A, Khan N, Mahajan V, Amrutkar S, Kumar D, 2022. Bakery Waste: A promising unconventional feed ingredient for Poultry. International Journal of Life Sciences and Applied Sciences 3(3):86-86.
16) Hossen S, Islam R, Aziz FB, Hasan MM, Parvez MM, 2018. Effects of turmeric paste on growth performance, immune response and blood characteristics in Japanese quail. International Journal of Science and Business 2(3):306-317.
17) ICAR, 2013. Nutrient requirement of Animals-Poultry (ICAR-NIANP), Indian Council of Agriculture Research, New Delhi.
18) Kennedy OOO, Mbaba EN, Iso IE, Halilu A, Robert AN, Micheal B 2019. Effects of turmeric rhizome powder on growth, carcass and meat quality of Japanese quails fed sorghum-soybean-based diets. Journal of Livestock Science 11: 1-7. doi.10.33259/JLivestSci.2020.1-7
19) Khalifa AH, Omar MB, Hussein SM, Abdel-mbdy HE, 2016. Nutritional value of farmed and wild quail meats. Assiut Journal of Agricultural Science, 47: 58-71.
20) Kichloo AA, Khan N, Sharma RK, Mahajan V, 2023 Comparative evaluation of different *Aloe vera* forms over quail performance during summer. Indian Journal of Animal Research 1-6.
21) Mondal MA, Yeasmin T, Karim R, Siddiqui MN, Nabi SR, Sayed MA, Siddiky MNA, 2015. Effect of dietary supplementation of turmeric (*Curcuma longa*) powder on the growth performance and carcass traits of broiler chicks. SAARC Journal of Agriculture 13(1):188-199.
22) Oko OOK., Asuquo OR, Agiang EA, Osim EE 2016.Neuroendocrine and behavioural responses of Japanese quails to dietary Aspilia africana leaf meal and extracts. Journal of Livestock Science 8: 43-51
23) Pandian C, Sundaresan A, Ezhil Valavan S, Omprakash AV, 2017. Economic traits and production performance of Nandanam quail reared at different cage stocking densities. Indian Journal of Veterinary Sciences and Biotechnology, 13 (2):31-33.
24) Semen DL, Moody WG, Fox JD, Gay N, 1987. Influence of hot and cold deboning on the palatability, textural and economic traits of restructured beef steaks. Journal of Food Science 52: 879-882.
25) Shokrollahi B, Sharifi B 2018. Effect of Nigella sativa seeds on growth performance, blood parameters, carcass quality and antibody production in Japanese quails. Journal of Livestock Science 9: 56-64
26) Snedecor GW, Cochran WG, 1994. Statistical methods. 8th Edition, The lowa state university, lowa, U.S.A.