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Research paper

Effect of supplementation of Turmeric, Black pepper and their combination as phytogenic feed additive on carcass characteristics and organoleptic parameters of Japanese quail

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ABSTRACT

Day-old quail chicks (N=150) were distributed randomly into five treatments with three replicates containing ten birds each and fed with five experimental diets T_1 (Basal diet), T_2 (Basal diet supplemented with 0.75% turmeric), T_3 (Basal diet supplemented with 1% black pepper), T_4 (Basal diet supplemented with 0.25% turmeric and 0.5% black pepper) and T_5 (Basal diet supplemented with 0.5% turmeric and 1% black pepper). Carcass traits like mean dressing percentage, weights of liver, heart, and gizzard did not show any significant difference among the treatment groups. The sensory evaluation scores were improved significantly ($p<0.05$) pertaining to juiciness, tenderness, and overall acceptability when compared with the control and the highest score for overall acceptability was observed in the group provided with a combination of turmeric (0.25%) and black pepper (0.50%) at a low level. Based on this study it can be concluded that a combination of turmeric and black pepper are more useful in improving the meat acceptability than individual supplementation in quail diets.

Keywords: *Black pepper, Carcass traits, Japanese Quail, Sensory evaluation, Turmeric*

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INTRODUCTION

Quail is considered to be an alternative poultry species popular for intensive rearing by farmers in India. Quails are popular for their high protein (26%) and less fatty (3%) meat (Shinde et al. 2014). Further, quail has unique qualities like hardiness and adaptability to diversified agro-climatic conditions making it ideal for rural poultry production, thus creating employment opportunities (Shukuhmand 2008).

Phytogenic feed additives derived from plants have gained increasing interest as natural growth-promoting feed additives in poultry production. Turmeric (*Curcuma longa*) and Black pepper (*Piper nigrum*) fall under such category of phytogenic feed additives. The active ingredients found in Turmeric are curcumin, demethoxy-curcumin, bisdemethoxy curcumin, (Wuthi-Udomlert et al. 2000). Curcumin has also been studied extensively as a chemopreventive agent in several cancers (Duvoix et al. 2005). Black pepper (*Piper nigrum*) is a well-known medicinal plant that grows in nature and is mainly cultivated in tropical parts of the world. It has many therapeutic effects like anti-ache effect (Moorthy et al. 2009), anti-oxidant and anti-bacterial effects (Gulcin 2005). In addition, it can enhance secretions of gastric and pancreatic enzymes thereby improving digestibility (Orav et al. 2004). A lot of research has been done in chicken to study the influence of these additives on meat quality but the literature available on Japanese quail is very scanty.

MATERIALS AND METHODS

The present experiment was performed to study the effect of phytogenic feed additives like turmeric, black pepper and their combinations on the performance of Japanese quail.

***Experimental Design*:** Day-old Japanese quail chicks (N=150) were weighed individually, wing banded at day old, and randomly divided into five equal groups of three repli[1]cates each with 10 chicks per replicate. Each group of quails was allotted one of the dietary treatments at random.

***Management and Feeding*:** All the quail chicks were housed in 5-tier battery cages throughout the experiment. Five experimental diets T_1 (Basal diet), T_2 (Basal diet supplemented with 0.75% turmeric), T_3 (Basal diet supplemented with 1% black pepper), T_4 (Basal diet supplemented with 0.25% turmeric and 0.5% black pepper), and T_5 (Basal diet supplemented with 0.5% turmeric and 1% black pepper) were prepared as per NRC 1994 standards (Table 1). Feed and water were provided *ad libitum* up to five weeks of age. An experiment was carried out under uniform management practices.

Table 1: Ingredient composition of Japanese quail experimental diet

Ingredient (kg)	Basal diet
Maize	49.8
Soyabean meal	34.0
DORB	8.91
Fish meal	5.0
DCP	0.2
Shell grit	1.2
Salt	0.25
Trace minerals*	0.15
L Lysine	0.06
L methionine	0.11
Vit AB2D3 E	0.15
Choline chloride	0.10
Coccidiostat	0.05

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Liver tonic		0.04
Total		100
Nutrient composition (Analysed)		
Crude Protein	(%)	24.48
ME (Kcal/kg)		2999.98
Calcium	(%)	1.46
Total Phosphorus	(%)	0.73

* 0.15kg L-trace minerals contains - manganese sulphate 8250 mg, Ferrous sulphate 7500 mg, zinc sulphate 7500 mg, cobalt sulphate 75 mg, copper sulphate 450 mg, potassium Iodide 450 mg, sodium selenite 75 mg. $Calculated values

***Carcass characteristics*:** At the end of the trial period (5th week), two birds per replicate and thus a total of six birds per treatment were randomly selected, weighed, and slaughtered. Individual weights of the eviscerated carcass (i.e. carcass yield) and edible organs like liver, heart, and gizzard were collected and weighed. Thus, relative weights (% of live body weight at slaughter) of carcass yield plus total edible organs were calculated.

***Sensory evaluation scores*:** The meat samples were cooked and subjected to ten member taste panel for sensory evaluation of colour, appearance, flavour, juiciness, tenderness, and overall acceptability on a nine-point hedonic scale.

***Statistical analysis*:** Statistical analysis of the data was carried out according to the procedures suggested by Snedecor and Cochran (1989). The data obtained were subjected to one-way ANOVA. Differences between means were tested at the 5% probability level using Duncan's (1955) LSD test.

RESULTS AND DISCUSSION

***Body weights*:** The mean body weight did not differ significantly in this study (Table 2). Similarly, Attia et al. (2017) in broilers observed that there was no significant effect on body weight gain with turmeric at 0.5, 1, and 2% levels. Kumar et al. (2017) also observed similar findings when supplemented with turmeric at the levels of 1, 2, 3, and 4g/kg in broilers. On contrary, Abuel Kader et al. (2018) in quails observed a significant ($p<0.05$) increase in body weight gains when supplemented with 1% and 3% levels of turmeric. Joy Singh et al. (2018) in broilers observed a significant increase ($p<0.05$) in the body weight gain at 0.5% level of black pepper powder. Abou-Elkhair et al. (2014) have observed a significant ($p<0.05$) increase in body weight gain upon supplementation of mixtures of turmeric and black pepper at 0.5% in the broiler.

Table 2: Mean (±S.E) carcass traits of Japanese quail fed with different levels of turmeric, black pepper and their combination at the fifth week of age

Treatment	Live body weight (g)	Dressing %	Liver weight (g)	Heart weight (g)	Gizzard weight (g)
	203.46±2.41	69.97±1.47	4.29±0.23	1.97±0.15	4.45±0.23
	194.93±1.25	69.62±1.18	5.40±0.62	1.93±0.13	4.22±0.37
	195.56±2.69	70.63±1.53	5.35±0.47	1.92±0.06	4.43±0.30
T4	200.83±8.26	69.98±1.97	4.42±0.46	1.84±0.06	4.18±0.12
T5	189.06±1.41	73.30±2.39	5.25±0.48	1.87±0.11	4.08±0.26
SEM	2.05	0.775	0.21	0.05	0.11
n	6	6	6	6	6
SS	NS	NS	NS	NS	NS

Carcass characteristics

Dressing percentage: The dressing percentage did not show any significant difference among the treatment groups (Table 2). Similarly, Pankaj Kumar Singh et al. (2018) observed that there was no significant difference in dressing percentage at 0.5, 1, and 1.5% levels of turmeric in broilers. Joy Singh et al. (2018) in broilers reported that the supplementation of black pepper at 0.5, 1, and 1.5% levels had no significant effect on dressing percentage. Abou-Elkhair et al. (2014) in broilers observed no significant difference in dressing percentage upon supplementation of mixtures of turmeric and black pepper at 0.5% level. On contrary, Mondal et al. (2015) and Raskar et al. (2019) noticed a significant ($p<0.05$) increase in dressing percentage at 0.5% turmeric in broilers. Al-Kassie et al. (2011) in broiler observed that there was a significant ($p<0.05$) increase in dressing percentage at 0.5, 0.75, and 1% levels of black pepper. But, Attia et al. (2017) in broilers observed a significant ($p<0.05$) decrease in dressing percentage at 0.5, 1, and 2% levels of turmeric.

Liver weight: In the present experiment there was no significant difference in liver weights among all the treatments (Table 2). Similarly, Mondal et al. (2015) and Attia et al. (2017) in broilers observed no significant difference in liver weights when supplemented with turmeric at 0.5, 1, and 2%. Al-Kassie et al.

(2011) in broiler observed that there was no significant effect on liver weight at 0.25, 0.5, 0.75, and 1% levels of black pepper.

Heart weight: There was no significant difference observed in heart weights among the treatments (Table 2). Similarly, Mondal et al. (2015) in broilers observed that there was no significant effect on heart weight at 0.25, 0.5, 1, and 1.5% levels of turmeric. Al-Kassie et al. (2011) in broiler observed that there was no significant effect on heart weights at 0.25, 0.5, 0.75, and 1% levels of black pepper. Abou-Elkhair et al. (2014) in broilers observed no significant difference in heart weights upon supplementation of mixtures of turmeric and black pepper at 0.5%.

Gizzard weight: In the present study gizzard weight did not show any significant difference among the treatment groups (Table 3). Similarly, Mondal et al. (2015) in broilers observed that there were no significant effects on gizzard weights at 0, 0.5, 1, and 1.5 % levels of turmeric. Al-Kassie et al. (2011) in broiler observed that there was no significant effect on gizzard weights at 0.25, 0.5, 0.75, and 1% levels of black pepper. Abou-Elkhair et al. (2014) in broilers observed no significant difference in gizzard weights upon supplementation of mixtures of turmeric and black pepper at 0.5%. Sugiharto et al. (2020) in broilers observed no significant difference in gizzard weights upon supplementation of mixtures of turmeric and black pepper at 1%. On contrary, Myandoab and Mansoub (2011) in quails observed a significant ($p<0.05$) increase in gizzard weights upon supplementation of black pepper at 2%. Whereas, Attia et al. (2017) in broilers observed a significant ($p<0.05$) decrease in gizzard weights when supplemented with turmeric at 0.5%.

Sensory evaluation: The sensory evaluation scores (Table 3) were improved significantly ($p<0.05$) pertaining to juiciness, tenderness, and overall acceptability when compared with the control, and the highest score for overall acceptability was observed in T_4 (combination of turmeric (0.25%) and black pepper (0.50%) at low level). Similarly, Prabhakaran et al. (2016) observed no significant effect on meat sensory characteristics like colour and flavour of Japanese quail meat when supplemented with black pepper at 0, 0.1, 0.2, and 0.3% levels. Pankaj Kumar Singh et al. (2018) in broilers observed no significant effect on sensory characteristics of meat like colour and flavour of broiler chicken meat when supplemented with turmeric at 0, 0.5, 1, and 1.5%. Joy Singh et al. (2018) revealed that there was improvement in the overall acceptability score of broiler meat over control when fed with 0, 0.5, 1, 1.5% levels of black pepper. Sugiharto et al. (2020) noticed that there was improved meat quality of broilers when supplemented with mixtures of turmeric and black pepper at 1%. On contrary, Pankaj Kumar Singh et al. (2018) observed no significant effect on sensory characteristics of broiler meat like tenderness, juiciness, and overall acceptability when supplemented with turmeric at 0, 0.5, 1, and 1.5%. Prabhakaran et al. (2016) in quails observed no significant effect on sensory characteristics of meat like tenderness, juiciness, and overall acceptability when supplemented with black pepper at 0, 0.1, 0.2, and 0.3% levels

Table 3: Mean (±S.E) Sensory evaluation scores of Japanese quail fed with different levels of turmeric, black pepper, and their combination

Treatment	Colour	Flavour	Juiciness	Tenderness	Overall Acceptability
	7.60±0.54	7.00±0.73	6.20^{b}0.64±	6.40^{b}0.61±	6.80^{b}0.48±
	8.20±0.38	8.00±0.47	8.20^{a}0.30±	7.50^{a}0.33±	7.70^{ab}0.44±
	8.40±0.33	8.00±0.21	7.80^{a}0.44±	8.20^{a}0.38±	8.00^{a}0.23±
	8.60±0.16	8.20±0.24	8.60^{a}0.16±	8.60^{a}0.16±	8.40^{a}0.16±
T5	7.40±0.16	8.00±0.21	7.80^{a}0.24±	7.80^{a}0.24±	7.80^{ab}0.24±
SEM	0.16	0.19	0.20	0.19	0.16
n	10	10	10	10	10
SS	NS	NS	*	*	*

NS ($p>0.05$), * ($p<0.05$)

CONCLUSION

Dietary supplementation of turmeric, black pepper, and their combinations at different levels did not affect the carcass characteristics like dressing percentage and giblet weight. The supplementation of turmeric, black pepper, and their combinations at different levels improved sensory evaluation scores pertaining to juiciness, tenderness, and overall acceptability. A combination of 0.25% turmeric and 0.5% black pepper (T_4) may be recommended for the production of designer meat with improved sensory meat quality.

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ETHICS STATEMENT: Not applicable

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