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Effect of Supplementation of L- Threonine on Growth Performance and Carcass Characteristics in Japanese Quails

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ABSTRACT

Day old Japanese quail chicks (n = 150) were randomly allocated to 5 groups with three replicates of 10 birds in each. Total five isocaloric diets (2900 kcal ME/kg feed) were prepared containing 24, 23, 22, 21 and 20% CP for the groups T_1 T_2, T_3, T_4 and T_5, respectively. L-threonine was supplemented in diet of each group at the rate of 0.0, 0.05, 0.1, 0.15 and 0.2% in the diet of groups T_1 T_2, T_3, T_4 and T_5, respectively. Body weight at 28 d was higher ($P<0.01$) in group T_3 as compared to other groups. The feed intake was similar in all the groups. The FCR was better in group T_3 where L-threonine was supplemented @ 0.1% in the diet. Supplementation of threonine resulted in increase ($P<0.05$) in the weight of thigh, however, other carcass traits did not differ among the groups. Hence Japanese quail could be raised on lower CP diet (22%) with 0.1% L-threonine supplementation to achieve better body weight gains and FCR without affecting carcass characteristics

Key words: Growth performance, Japanese quail, L-threonine, Supplementation

INTRODUCTION

Recently, Japanese quails began to attract the interest of quail producers with the perspective of reaching a different range of the consumer market and to enable the productive exploitation of birds to augment meat production. Quails are able to withstand environmental constraints due to their inherent ability to grow under natural conditions. Protein and amino acids play important role in least cost feed formulations for poultry. Progressive reduction in crude protein (CP) content can induce a situation in which other amino acids such as threonine become limiting to support better performance (Ramalho de Lima *et al.,* 2013). Now a days, crystalline amino acids are available commercially that can be added to the feed in specific quantities and quality of the feed protein can be enhanced and reduction of crude protein in diet is possible. As threonine is the third limiting amino acid in low CP based diets for poultry after methionine and lysine (Kidd and Kerr, 1996), therefore, by using L- threonine further reduction in dietary CP beyond requirement is possible (Abbasi *et al.,* 2014). A lot of research on amino acid requirements in chicken has been conducted but the quails have received less attention. Hence, the present study was conducted to see the effect of dietary supplementation of L- threonine on growth performance and carcass characteristics in Japanese quails.

MATERIALS AND METHODS

Day old Japanese quail chicks (n=150) were randomly divided into 5 groups, each group had 3 replicates of 10 chicks in each. The chicks were reared under deep litter system. Total five isocaloric diets (2900 kcal ME/kg feed) were prepared containing 24, 23, 22, 21 and 20% CP for the groups T_1 T_2, T_3, T_4 and T_5, respectively. L-threonine was supplemented in diet of each group at the rate of 0.0, 0.05, 0.1, 0.15 and 0.2% in the diet of groups T_1 T_2, T_3, T_4 and T_5, respectively. The total concentration of L-threonine in the diet was 1.001, 1.013, 1.017, 1.024 and 1.041% in the respective groups. Diets were prepared using conventional feed ingredients (Table 1).

Growth performance of the birds was recorded in terms of weight gain, feed consumption and feed conversion ratio from 0 to 28 days of age. Feed intake was recorded weekly. Chicks were weighed individually at weekly intervals and the average gain in body weight under each dietary treatment was calculated. Feed conversion ratio (FCR) was calculated as kg feed intake/kg gain. On day 28, 3 birds from each replicate were sacrificed for evaluation of carcass

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Table 1. Ingredient composition (%) of Japanese quails (0-28 d) diet

Feed ingredient	Group				
	T_1	T_2	T_3	T_4	T_5
Yellow maize	50.00	49.5	51.4	52.25	53
Soya DOC	43.50	40	37	33.5	30.4
De oiled rice bran	2.00	5.8	7	9.5	12
Soya Oil	1.55	1.75	1.65	1.8	1.65
DCP	1.00	1.00	1.00	1.00	1.00
LSP	1.00	1.00	1.00	1.00	1.00
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.05	0.05	0.05	0.05	0.05
Feed premix*	0.80	0.80	0.80	0.80	0.80
L-threonine supplemented (%)	0	0.05	0.1	0.15	0.2
L-threonine present in feed	1.001	0.969	0.926	0.874	0.844
Overall L-threonine (%)	1.001	1.013	1.017	1.024	1.041

Trace mineral premix mg/kg diet: Mg 300, Mn 55, Fe 56, Zn 30, Cu 4; vitamin premix (per kg diet) : vit. A 8250IU, vit. K 1mg, vit.E 26.84 mg, vit. B1 2 mg,vit. B2 4 mg, vit. B12 100µg, Niacin 60 mg, pantothenic acid 10 mg; choline 500 mg and 30 ppm salinomycin (Coxistac 12%), 55 ppm bacitracin methylene di salicyclate (BMD110)

characteristics. The diets were analysed for proximate principles, Ca and P contents (AOAC, 2005). Data were subjected to one way ANOVA (Snedecor and Cochran, 1994) using SPSS package (SPSS ver. 10.0).

RESULTS AND DISCUSSION

The chemical composition of different diets has been given in Table 2. Overall, the body weight at 4 week was higher ($P<0.05$) in quails fed diet containing 22% CP with threonine @ 0.10% (Table 3). Further increase in the level of threonine with reduced protein did not have any significant effect on body weight. The findings are in accordance with Shi *et al.* (2010) who reported that increase in dietary threonine resulted in an increase and then a decrease in body weight in Yangzhou geese. This pattern indicated that excess threonine might cause an imbalance in the amino acid profile of the diet which altered the body metabolism. Improved body weight gain in broiler with increase in L-threonine level has also been reported by Rezaeipour *et al.* (2012) and Estalkhzir *et al.* (2013). In contrast, Ayasan *et al.* (2011) reported that threonine supplementation had no significant difference on body weight gain but a quadratic response was observed in final body weight of broiler.

Dietary supplementation of threonine did not influence feed intake in quails (Table 3) as also reported

Table 2. Nutrient composition (% DM basis) of Japanese quail diet

Particular	Group				
	T_1	T_2	T_3	T_4	T_5
Moisture	9.74	9.43	9.32	9.35	9.20
CP	24.02	23.01	22.03	21.01	20.02
EE	3.08	3.79	2.35	3.05	3.97
CF	4.51	5.04	4.60	4.98	5.06
Ca	0.89	0.82	0.85	0.86	0.81
P	0.34	0.46	0.43	0.39	0.30
ME (kcal/kg)	2904	2902	2909	2902	2907

Table 3. The effect of L-threonine supplementation on feed intake, body weight and feed conversion ratio in Japanese quails

Group	Cumulative feed intake (g/bird)				Cumulative body wt (g)				Feed conversion ratio			
	7 d	14 d	21 d	28 d	7 d	14 d**	21 d	28 d*	7 d	14 d*	21 d	28 d
T_1(0%	46.71	160.0	315.99	488.95	28.18	64.84[b]	106.9	139.30[b]	3.96	2.47[a]	2.96	3.51
L-threonine)	±1.27	±2.14	±5.79	±3.98	±1.62	±1.61	±1.81	±2.65	±0.18	±0.03	±0.04	±0.04
T_2(0.05%	48.11	166.9	329.57	505.88	28.08	64.03[b]	104.0	138.0[b]	3.95	2.61[a]	3.19	3.67
L- threonine)	±1.06	±4.78	±8.67	±5.75	±1.20	±1.19	±4.81	±1.88	±0.03	±0.07	±0.22	±0.13
T_3(0.10%	48.11	160.06	316.37	502.59	32.39	74.44[a]	118.2	151.6[a]	3.45	2.15[b]	2.68	3.31
L- threonine)	±0.56	±5.46	±8.45	±7.94	±1.01	±1.05[a]	±2.04	±2.63	±0.11	±0.06	±0.03	±0.03
T_4(0.15%	47.50	158.2	310.1	487.3	28.94	64.14[b]	104.1	137.1[b]	3.87	2.48[a]	2.99	3.56
L- threonine)	±1.66	±4.72	±7.49	±7.41	±2.23	±2.26	±3.86	±3.47	±0.35	±0.16	±0.19	±0.19
T_5(0.2%	45.48	161.09	314.02	505.25	26.13	64.62[b]	106.0	130.3[b]	4.09	2.50[a]	2.97	3.90
L- threonine)	±0.66	±3.22	±8.82	±21.16	±0.51	±2.11	±5.06	±470	±0.08	±0.04	±0.11	±0.31

[a,b] Means bearing different superscripts in a column differ significantly (*P< 0.05; **P< 0.01)

by previous researchers (Dozier *et al.* 2000, 2001; Ayasan *et al.* 2011; Mazraeh *et al.,* 2013). Feed conversion ratio was similar in different groups on first, third and fourth week, however, it was better (P<0.05) in group T_3 at 2nd week which might be due to increased nutrient utilization in this group though the CP level was below the recommended level in the diet. The findings corroborated with those of Rezaeipour *et al.* (2012) and Dozier *et al.* (2000). Similarly, significant effect on feed/gain ratio has been reported in geese (Shi *et al.,* 2010) in quails (Abdel-wareth *et al.,* 2014) when threonine was supplemented in the diet.

The dressing percent weight of internal organs and various cuts of Japanese quails were similar in different groups. Weight of thigh in terms of percent live weight was higher (P<0.01) in group T_5 as compared to groups T_3 and T_4, however, weights of heart, liver, gizzard, back and neck, breast and wing were similar in different grousp (Table 4). The observations were in accordance with the findings of Shayan *et al.* (2013) who reported that dressing percentage, weights of internal organs were not affected by reducing CP in quail diets. Similarly, Baylan *et al.* (2006) reported that dietary threonine in the feed did not influence chilled

Table 4. Effect of L-threonine supplementation on various carcass cuts of Japanese quails as percentage of live weight at day 28

Group	Weight of carcass cuts as percentage of live weight									
	Live wt.	Dressed wt.	Liver	Heart	Gizzard	Breast	Thigh	Wing	Back and neck	Giblet
T_1 (0%	141.38	70.00	2.11	0.94	2.10	10.31	17.03[a]	22.80	14.80	5.15
L-threonine)	±8.03	±0.73	±0.19	±0.06	±0.19	±0.40	±0.34	±0.72	±0.94	±0.38
T_2(0.05%	136.00	70.67	2.00	0.93	2.07	11.99	17.08[ab]	23.21	12.88	4.99
L- threonine)	±5.08	±1.21	±0.14	±0.08	±0.02	±0.65	±0.40	±0.52	±0.95	±0.21
T_3(0.10%	149.88	69.83	2.40	1.17	2.12	11.92	16.43[b]	23.21	13.67	5.69
L- threonine)	±3.03	±0.34	±1.31	±0.12	±0.10	±0.10	±0.19	±0.87	±0.26	±0.39
T_4(0.15%	140.00	69.82	1.86	1.00	1.92	11.57	16.84[b]	23.30	12.91	4.81
L- threonine)	±7.69	±0.85	±0.19	±0.04	±0.16	±1.08	±0.23	±0.58	±0.28	±0.13
T_5(0.2%	142.00	69.75	2.10	1.01	2.12	10.87	16.94[b]	23.38	13.30	5.23
L- threonine)	±5.40	±0.49	±0.13	±0.04	±0.16	±0.55	±0.27	±0.61	±1.09	±0.15

[a,b] Means bearing different superscripts in a column differ significantly (P< 0.05)

carcass weight nor its relative yield in quail. Similar findings were also reported in broilers (Rezaeipour *et al.,* 2012; Dozier *et al.,* 2000). Shi *et al.,* (2010) observed no significant linear or quadratic responses for carcass traits in geese. Kerr *et al.* (1999) also reported that carcass yield was unaffected by dietary threonine supplementation. Increased thigh weight due to supplementation of threonine as reported in the experiment corroborated with the findings of Kerr *et al.* (1999) and Dozier *et al.* (2000).

CONCLUSION

It is concluded that Japanese quails could be raised by feeding lower CP diet (22%) with 0.1% L-threonine supplementation to achieve better performance in terms of body weight and feed conversion ratio without affecting carcass characteristics.

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