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Effects of L-Carnitine and Vitamin C-Electrolyte Premix Supplementation to Diet Containing Safflower Seed on Performance, Egg Quality and Some Serum Parameters in Quails under Summer Condition

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Abstract: This study was aimed at determining the effect of L-carnitine and vitamin C electrolyte premix supplementation to diets containing safflower seed, which is high oil content, on performance, egg quality and some serum parameters in quails under summer condition. For this purpose, quails of 227 days of age were randomly divided into 3 groups of 20 animals each. Group I was fed with safflower seed and served as control group. Group II was fed with control group diet plus vitamin C-electrolyte premix. Group III was fed with control group diet plus L-carnitine. Quails, received the experimental diets for 9 weeks. Diets and water were provided *ad libitum*. Egg weight and feed consumption were not significantly different among groups. The lowest egg production observed in carnitine group. Egg production and feed conversio ratio were found to be 79.76, 83.21, 69.09% and 386.33, 410.86, 457.56 g feed/1dozen egg in control, electrolyte premix and carnitine groups respectively. The levels of serum glucose in the Vitamin C-electrolyt premix group was significantly higher than in the control group and carnitine group ($p<0.05$)

Key words: Safflower seed, vitamin C, electrolyte premix, quail, performance, bochemical parameters

INTRODUCTION

L-carnitine (β-hydroxy γ-trimethylamino butyrate) is a vitamin like compound. It is water soluble and naturally syntheses in microorganisms, plants and animals. Plants and plant-based feedstuffs generally contain very little carnitine compared with animals tissues (Steiber *et al*., 2004). L-carnitine is found in all body cells. Synthesis of L-carnitine requires essential amino acids (such as lysine and methionine), vitamins (ascorbic acide, niacin and pyridoxine) and mineral (iron) (Haeckel *et al*., 1990). However, endogenous biosynthesis of L-carnitine is'n sufficient under stress, higher performance and diets rich in fat (Celik and Ozturkcan, 2003). It is essential for the transportation of long and medium chain fatty acids into the mitochondria for beta oxidation and remove out from mitochondria of short and medium chain fatty acids (Arslan, 2006; Mansour, 2006). A number of studies reported a beneficial or not beneficial effect of L-carnitine supplementation to poultry (Rabie *et al*., 1997; Celik and Ozturkcan, 2003; Arslan *et al*., 2003; Corduk *et al*., 2008; Yalcin *et al*., 2008; Zahai *et al*., 2008). The effect of heat stress on electrolytes in birds is well known. The monovalent minerals sodium, potassium, a chloride are known as strong ions because they exert characteristic effects on the chicken's acid base homeostasis (Olanrewaju *et al*., 2007). Vitamin C is a water soluble vitamin required by the body to maintain normal metabolic activities and is syntheses in the body physiological requirements in poultry but this ability is inadequate under stress conditions such as low or high environmental temperatures. Vitamin C is an effective antioxidant, which is used for reducing the negative effects of environmental stress in the diets of poultry because of the reported benefits of vitamin C supplementation on poultry under heat or cold stress. Vitamin C participates in the biosynthesis of carnitine (Celik and Ozturkcan, 2003; Gursu *et al*., 2004; Bardakcioglu *et al*., 2005). Heat stress may occur at 27°C and above (Bardakcioglu *et al*., 2005).

Safflower (*Carthamus tinctorius* L.) is an annual herbaceous crop. Meal or seedcake is used as feed for livestock that from unhulled seeds containing 18-24% protein, from hulled seed, 28-50% protein. Seeds contain

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32-40% oil, 11-17% protein and 4-7% moisture (Duke, 1983). Yoshimasa and Michiko (1999) reported that a methanol extract of C tincrorius lowered the total cholesterol and triglyceride level of normal and cholesterol-fed mice. In recent years, due to support by Ministry of Agriculture, safflower production increase in Turkey. Scientist is interested in Safflower seed and product recently.

The aims of the study were to determine the effects of L-carnitine and vitamin C-electrolyte premix supplementation to diets containing safflower seed, which is high oil content on performance, egg quality and some serum parameters in quails under summer condition.

MATERIALS AND METHODS

This study was carried out in the Mehmet Akif Ersoy University, Faculty of Veterinary Medicine, Quail Production Unit from June 12-August 15, 2006. A total of 60 Japanese quails (Coturnix coturnix japonica) aged 227 days were housed in cages and randomly distributed into 3 groups each containing 20 quails. Each group was divided into 4 replicates. Feed and water were provided *ad libitum*. Eggs were collected daily. Data on feed intake and refuse were collected weekly.

Animals were fed basal diet containing 7.5 safflower seed (C; Control group), 2 kg ton^{-1} karserin-C (Sodium, potassium, chlorite, vitamin C, lactose) added to basal diet (EP; Electrolyte Premix group) and 100 mg kg^{-1} L-carnitine base a dded to basal diet (CA; Carnitine group) for 9 weeks. Basal diet is shown in Table 1. Blood serum total cholesterol, triglyceride and glucose were determined by commercially available kit.

Egg yolk total cholesterol was analyzed by commercial kit in spectrophotometer. Differences between obtained values were carried out by analysis of variance and the significance of mean differences was tested by the Duncan's test.

Table 1: Composition of basal diet (%)

Feed stuffs	Values
Maize	45.00
Soybean meal	34.25
Vegatable oil	4.75
Safflower seed	7.50
Limestone	7.00
DCP	0.70
Salt	0.30
Vit. premix	0.20
Min. premix	0.10
Methionin	0.20
HP (%)	20.05
ME (kcal kg^{-1})	2908.25

RESULTS AND DISCUSSION

Average house temperatures throughout the experiment were 22.14, 26.86, 26.93, 24.29, 28.43, 29.29, 30.14, 31.43, 31.29°C determined during 9 weeks, respectively. Imik *et al.* (2009) reported that thermoneutral temperatures for poultry housing are between 18-22°C. Egg weight determined biweekly and no statistically differences found among groups (Table 2). Egg production was 79.76, 83.21 and 69.09%, C, EP, CA groups, respectively ($p<0.001$) (Table 3). Feed efficiency (g feed/dozen egg) was shown that in Table 3 as 386.33, 410.86 and 457.56, respectively ($p<0.01$).

The lowest egg weight was measured in EP group but differences were not significant and the highest egg production was obtained EP group during the experiment ($p<0.001$).

The fact that the highest egg production was obtained in the lowest egg weight mean group could be explained by the negative correlation between egg production and egg weight (Bardakcioglu *et al.*, 2005).

The results of this study showed that feed conversion ration was higher ($p<0.01$) for quail fed the carnitine diet when compared to quail fed the vitamin C electrolyte premix group and control group (Table 2).

Egg production in carnitine group was lower than vitamin C electrolyt premix group and control group (Table 2). This result is supported by Rabie *et al.* (1997) reported that dietray L-carnitine did not influence laying performance (egg production rate, mean egg weight, daily feed intake, daily egg mass and feed conversion) or external egg quality. Similarly Yalcin *et al.* (2006) reported that L-carnitine supplementation to diets did not significantly affect daily feed intake, daily metabolizable energy intake, egg production, egg weight, feed efficiency.

However, Celik and Ozturkcan (2003) reported that the results of this study showed that L-carnitine and ascorbic acid alone or in combination, may slightly increase weight and carcass weight in broiler chicks at high environmental temperatures. Blood serum levels of triglyceride and cholesterol were not affected by vitamin C electrolyte premix and L-carnitine. But serum glucose was EP group

Table 2: Egg weight

No. of egg weight	Groups			
	Control	Elektrolit premix	Carnitine	p-value
1	11.9432±0.2855	10.9071±0.2602	11.6228±0.2861	0.062
2	11.7483±0.3023	11.2079±0.2970	11.9335±0.2710	0.221
3	11.1895±0.3824	10.9868±0.3101	10.8288±0.3177	0.745
4	10.7715±0.3519	10.6568±0.3622	11.0542±0.2522	0.657
5	11.1809±0.2739	10.5610±0.3964	11.0609±0.3382	0.420

Table 3: Average egg production, feed consumption, Feed Conversion Ratio (FCR), in laying quail, $p<0.01$

Parameters	Control group	Elektrolit premix group	Carnitine group	p-value
Egg production (%)	79.76±1.67[b]	83.21±2.46[b]	69.09±1.47[a]	0.0001***
Feed consumption (g day quail^{-1})	25.45±0.73	27.21±0.76	25.99±0.76	0.239NS
Feed conversio ratio (g feed/1dozen egg)	386.33±10.98[a]	410.86±17.99[a]	457.56±13.31[b]	0.003**

**p<0.01; ***p<0.001; NS: Non Significant

Table 4: Effects of rations on egg and serum parameters

Parameters	Control group	Elektrolit premix group	Carnitine group	p-value
Egg weight (g)	10.9168±0.3549	10.9558±0.3508	10.5723±0.3430	0.697
Egg yolk weight (g)	3.6915±0.1528	3.4532±0.0974	3.3823±0.1650	0.283
Egg yolk cholesterol (mg g^{-1}, yolk)	33.2550±0.2662	33.9733±0.5771	34.0217±0.6160	0.501
Serum triglyceride (mmol L^{-1})	8.3296±0.6145	7.4138±0.6398	7.6925±0.5065	0.537
Serum cholesterol (mmol L^{-1})	6.4342±0.5602	6.4850±0.8760	7.6275±0.8228	0.468
Serum glucose (mmol L^{-1})	14.4142±0.5351[b]	16.1325±0.7930[a]	14.0117±0.3737[b]	0.038*

*p<0.05

(16.13 mmol L^{-1}) higher than C group (14.41 mmol L^{-1}) and CA group (14.01 mmol L^{-1}) ($p<0.05$) (Table 4). Whereas Sahin *et al.* (2002) reported that serum glucose, cholesterol and triglyceride decreased but total protein, albumin concentration increased, when dietary vitamin C and Folic acid supplementation.

In the present study, dietary vitamin C electrolyte premix supplementation resulted in a increase in serum glucose but serum levels of triglyceride and cholesterol were not changed compared to control groups. Also egg cholesterol content was not affected by the supplementation of L-carnitine. This result is supported by Yalcin *et al.* (2005).

Egg production and feed efficiency were not agreement with Yalcin *et al.* (2005). As shown in Table 4, L-carnitine had no significant effect on serum glucose this finding similar (Arslan *et al.*, 2003).

Arslan *et al.* (2003) reported that L-carnitine administration did not effect carcass traits and serum cholesterol, total lipid, triglyceride and glucose levels.

On the other hand, Uysal *et al.* (1999) reported that L-carnitine and Vitamin C supplementation to diet have the ability of decreasing triglyceride level, in the study triglyceride level of EP group and CA group are lower than control group as numerically (control, 8.33; EP,7.41; CA,7.69 mmol L^{-1}, $p>0.05$).

CONCLUSION

Vitamin C-electrolyte premix added to basal diet containing safflower seed increased the egg production and serum glucose, also L-carnitine added to basal diet containing safflower seed decreased egg production and increased feed conversion ratio in this study.

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