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Submission date: 21-Jun-2020 11:58AM (UTC+0300)
Submission ID: 1347314603
File name: 1.pdf (278.71K)
Word count: 3467
Character count: 19050

Plant Archives Vol. 19 No. 2, 2019 pp. 4423-4428 e-ISSN:2581-6063 (online), ISSN:0972-5210

EFFECT OF SUPPLEMENTING CARNITINE AND ASCORBIC ACID TO THE RATIONS ON SOME PRODUCTIVE AND BLOOD PARAMETERS OF PEKIN DUCKS

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Abstract

The research was conducted to investigate the effect of carnitine and ascorbic acid supplementation to the rations of pekin ducks on some productive and hematological traits. A total number of 180, 7 days old pekin duck chicks were distributed randomly on 4 equal treatments. Treatments were as follow: T_1: control, T_2: supplemented with 300 mg/kg carnitine T_3: supplemented with 300 mg/kg ascorbic acid. T_4: supplemented with a combination of 150 mg /kg carnitine plus 150 mg/kg ascorbic acid. Results illustrated amelioration of live body weights, weight gain, feed conversion ratio, increased PCV and total blood protein with reduction of blood cholesterol and glucose.

Key words **:** Pekin ducks, Carnitine, Ascorbic Acid.

Introduction

Meat type ducks are primarily raised in small or large flocks for meat production, Since duck meat contains about 20% crude protein and 2% fat (William and Sandhu, 2000). Like wise ducks are the most efficient type of birds which are able to convert some materials such as fallen grains, insects and plant materials into edible meat (Bird, 1986). More over ducks may need different types of rations such as starter, grower and finisher. Feed supplements like energetic complementary supplements with vitamins may be needed as feed supplements for ducks. Carnitine is a vitamin like compound which is synthesized endogenously from lysine and methionine. Vitamin B6, B12, ascorbic acid, folic acid, niacin and iron are necessary catalysts for endogenous synthesis (Vazet *et al*., 2000). Carnitine plays an important role in metabolism of lipids since it carries long chain fatty acids in to mitochondria for beta oxidation producing energy which is needed by cell for proper functions in the body (Rasmy *et al.,* 2001, Hopel, 2003). Additionally, carnitine participates in the process of cellular detoxification since it removes Acyl-CoA from the mitochondria. Furthermore it protects cellular membranes against oxidative damage resulting from peroxidation of polyunsaturated fatty acids which are the components of membrane phospholipids (Arrigoni and Caso, 2001).

Studies concerning the effect of carnitine supplementation to ducks were limited. Al-Denawy (2013) referred to fortification of diet supplemented with L-Carnitine to ducks. L-Carnitine ameliorated the productive efficiency of such ducks fed on L-Carnitine supplementation.

Domestic fowls may need supplemental ascorbic acid beyond its innate ability to synthesize this vitamin particularly in environmental, nutritional and pathological conditions. Ascorbic acid is involved in several functions related to its reversible oxidation reduction functions (Franceshi, 1992, Johnston *et al*., 2006). Moreover, Ascorbic acid is required for differentiation of connective tissues derived from the mesenchyme (Hay *et al*., 1994, I keda *et al*., 1997). It can be oxidized and reversibly reduced, so it plays an important role in electron transfer in the cell with metabolic oxidation of certain amino acids including tyrosine. Furthermore, ascorbic acid aids in metabolism of metal ions due to its reducing and chelating properties, thus it results in enhanced absorption of minerals from the diet and their metabolism and

distribution through out the body (Olivares *et al.*, 1997). Ascorbic acid plays an important role in synthesis of glucocorticoid in adrenal glands. During stress, glucocorticoids which inhibit the immune response are increased so ascorbic acid reduces adrenal glucocorticoids synthesis helping to maintain immunocompetence (Ferket, 1994, Jacob, 1995).

Materials and methods

The experiment had been conducted in the poultry farm at Al-Mussaiab Technical Institute during the 1st of March till the 25th April, 2018.

A total number of 180, 6 days old pekin duck chickens were used in the experiment, those chickens had been brought from a local market in Baghdad.

Pekin duck chickens had been allotted randomly at the beginning of the second week of age into 4 equal treatments, each treatment included 45 chicks distributed equally ito 3 replicates. During the experiment which had been lasted for 8 week, chickens fed on the starter ration which contained 22.74% crude protein with 3078 kcal/kg energy till 21 days of age, then they had been fed on the finisher diet which contained 20.16% crude protein with 3125.2 kcal/kg energy (Table 1) till the end of the experiment.

Table 1: Feed ingredients with chemical analysis of starter and finisher diets.

Ingredients	Starter (1-21 day)	Finisher (22 – 56 day)
Yellow corn	30	30
Soya bean meal	28	20
Wheat	27.7	35.5
Animal protein	10	10
Animal Protein Concentrate	-	-
Vegetable Oil	3	3
Nacl	0.3	0.3
Limestone	1	1.2
Total	100	100
Calculated chemical composition		
Energy (Kcal / Kg)	3078	3125.2
Crude Protein	22.74	20.16
Energy / Protein	135.35	155.07
Calcium %	0.79	1.0
Phosphorous %	0.41	0.48
Methionine + Cysteine	0.83	0.75
Lysine	1.2	0.95

(NRC 1994) * Protein concentrate, Brocom-5 special w. Wafy. contained 40% crude protein, 5% fat, 2% fiber, 2150 Kcal/Kg metabolized energy, methionine 3.7%, lycine 3.85%, Ca 5.6%, available phosphorous 4.65%.

Experimental rations were formulated by supplementing 300 mg/Kg feed L-Carnitine and 300 mg/kg feed ascorbic acid. Therefore, the arrangement of treatments were as follow.

Treatment 1 (T_1): Birds fed on a diet with out any supplement (control).

Treatment 2 (T_2): birds fed on a diet supplemented with 300 mg / kg L-Carnitine.

Treatment 3 (T_3): Birds in this treatment supplemented with 300 mg/kg ascorbic acid.

Treatment 4 (T_4): birds in this treatment supplemented with a combination of 150 mg/kg L-Carnitine plus 150 mg/kg ascorbic acid .

L-Carnitine was supplied from AMS Company (American Medic and Science), it contains Acetyl L-Carnitine (pure carnitine). Meanwhile ascorbic acid was supplied from Global Nutrition International Company (99.7%).

Birds had been fed *adlibitum* on the basal diet with the drinking water along the experiment.

Live body weights, weight gains, utilized feed were recorded weekly and feed conversation ratio was calculated weekly as well. Blood samples had been collected from the birds in the experimental treatment at the 8th week from the brachial vein in order to estimate some blood parameters such as packed Cell Volume (PCV) according to (Haen, 1995). Estimation of blood biochemical traits had been depended on using a special kit (Agappe Swiss Company) to estimate total protein (Varley *et al.,* 1980), blood glucose (Asatoor and King, 1954) and blood cholesterol (Richmond, 1973). Data had been statistically analyzed by using completely Randomized Design (CRD) according to (SAS, 2012), significant differences were compared by (Dumcan, 1955).

Results and discussion

Results of table 2 referred to non significant differences between live body weights of duck birds during the 2nd, 3rd and 4th week of age in the experiments. Meanwhile, live body weights of birds were significantly surpassed in supplementation treatments which were represented by carnitine and ascorbic acid. Significant surpassing of live body weights were noticed in the 4th treatment in which birds supplemented on a combination of carnitine plus ascorbic acid. Live body weights were 1970.5, 2179.5, 2405 and 2766.5 gm in the 4th, 5th, 6th, 7th and 8th week of age respectively .

Weekly weight gains of duck birds (Table 3) indicated significant surpassing between treatments along weeks

Table 2: Effect of supplementing carnitine with ascorbic acid on live body

Treatment	Weights of Ducks						
	Weeks						
	2	3	4	5	6	7	8
T_1: (Control)	1049 a	1262.5a	1474.5a	1681 a	1894a	2104a	2275a
T_2: Carnitine 300 mg/kg	1189 a	1399 a	1653.5b	1877 b	2087.5b	2293 b	2500b
T_3: Ascorbic acid 300mg/kg	1101.5a	1358 a	1641.5c	1879bc	2084 bc	2296.5bc	2526bc
T_4: Carnitine 150mg + ascorbic acid 150 mg	1172.5a	1435 a	1747.5d	1970.5d	2179.5d	2405 d	2766.5d
Significance	NS	NS	*	*	*	*	*

* P<0.05, (Letters differ vertically indicating significant differences between treatments).

Table 3: (gm) in duck birds Effect of supplementing carnitine with ascorbic acid on

Treatment	Weight Gains						
	Weeks						
	2	3	4	5	6	7	8
T_1: (Control)	343a	175a	212a	206.5a	213a	210ab	171a
T_2: Carnitine 300 mg/kg	405.5b	264b	254.5b	223.5b	210.5ab	205.5a	207b
T_3: Ascorbic acid 300mg/kg	309.5c	172a	283.5c	237.5c	205cb	212.5b	229.5c
T_4: Carnitine 150mg + ascorbic A 150	423d	214c	312.5d	223b	209ca	225.5c	361.5d
Significance	*	*	*	*	*	*	*

* P<0.05, (Letters differ vertically indicating significant between treatments).

of the experiment. Combination of carnitine with ascorbic acid supplementation showed significant surpassing of weight gains in the 4th treatment which were 423, 214, 312.5, 223, 209, 225.5 and 361 gm during the second week till 8th week respectively .

A melioration of live body weights and weight gains of duck birds in supplementation treatments of carnitine and ascorbic acid or combination of carnitine plus ascorbic acid may be attributed to those supplements. It was known that carnitine plays an important role in energy regulation as well as it favors muscles growth (Greenhaff, 2001). Moreover carnitine stimulates Insulin like growth factor (IGF1) in blood which in turn increases the body muscular mass, elevated IGF affects growth hormone which stimulates thyroxine hormone (Michiels *et al*., 2012). Results of the present study are inconsistent with Al-Shamary and Fahad (2017a). Who reported of improvement of live body weight of broiler chicks supplemented with 300 mg/kg carnitine.

Implication of supplemental ascorbic acid may take part in a melioration of live body weights and weigh gains of ducks due to the important metabolic role of ascorbic acid as a result of it's reducing properties and functions as an electron donor. Likewise ascorbic acid is recommend in poultry feed as a supplement to alleviate stress, on assumption that during stress the requirements may exceed the synthesizing ability (Olivares *et al*., 1997, Surai *et al*., 2002).

Physiological stressors such as heat, diseases or overcrowding may augment the chickens requirement for ascorbic acid. More over the ambient temperatures impair absorption of ascorbic acid and increase dietary requirement of this vitamin.

Table 4: Effect of supplementing carnitine with ascorbic acid on feed

Treatment	Consumption of ducks.						
	Weeks						
	2	3	4	5	6	7	8
T_1: (Control)	400a	638.5a	550a	630a	632.5a	607.5a	662.5a
T_2: 300 mg Carnitine	600 a	575b	566a	526.5b	625a	632.5b	686.5b
T_3: 300 mg/kg Ascorbic A AA	443.5c	624.5c	620b	610c	525b	645b	625c
T_4: 150 mg/kg + 150 mg/kg AA	410ac	541.5a	630b	660d	632.5a	648.5c	666a
Significance	*	*	*	*	*	*	*

* P<0.05, (Letters differ vertically means significant differences).

Table 5: Effect of supplementing carnitine and folic acid of FCR in ducks.

Treatment	Weeks						
	2	3	4	5	6	7	8
T_1: (Control)	1.49a	3.76a	2.61a	3.05a	2.96a	2.89a	3.91a
T_2: 300 mg/kg Carnitine	1.48b	2.17b	2.22b	2.35b	2.97a	3.08b	3.36b
T_3: 300 mg/kg AA	1.09c	3.78c	2.18c	2.57c	2.55c	3.04c	2.75c
T_4: 150 mg/kg Carnitine + 150 mg/kg AA	0.97d	2.99d	2.05d	2.96d	3.02a	2.87d	1.84d
Significance	*	*	*	*	*	*	*

* P<0.05, (Letters differ vertically indicating significant differences).

Improvement of live body weights and weight gains may be due to the effect of ascorbic acid in metabolism of amino acids and minerals as well as for hormones synthesis (Khan *et al*., 2012).

Feed consumption varied among treatments (Table 4), it was higher when duck birds supplemented carnitine or ascorbic acid, and the differences were significant. However, throughout the 4th treatment in which duck birds fed on a combination of carnitine with ascorbic acid, higher feed consumption was noticed significantly. Dietary supplementation of carnitine may increase feed consumption due to fatty acid oxidation with amelioration of nitrogen consumption with nitrogen balance (Al-Khafagy, 2016, Al-Shamery and Fahad, 2017a).

The inclusion of ascorbic acd as a supplement to the ducks ration increase feed intake. Sahin *et al*., (2003) concluded that the physiological and performance of ascorbic acid has been ascribed to an increase in the birds appetite resulting in increased feed intake. These observations were coincided with (Sahan *et al*., 2004).

Results revealed significant differences between treatments in feed conversion Ratio (FCR) along all weeks of the experiment in the 5th week (Table 5). Improvement of FCR may be attributed to inclusion of supplemental carnitine and ascorbic acid or combination of carnitine with folic acid in the 2nd, 3rd and 4th treatments. The results could be attributed to the different amounts of feed consumed and effect of carnitine and ascorbic acid in the diet, carnitine improves nitrogen balance in the birds (Parsaeimehr *et al*., 2012). Mean while, the inclusion of ascorbic acid in ducks feed appears to alleviate many undesirable physical consequences as well as it has been established that ascorbic acid ameliorates the adverse effects of stressful environmental conditions thus it improves FCR (Whitehead, 2003).

Table 5 shows blood variables at the end of the experiment (56 day) in ducks receiving L-Carnitine and ascorbic acid. Feeding L-Carnitine 300 mg/kg caused a significant increase in PCV. Ascorbic acid had significantly higher than did ducks fed the control diet.

Carnitine could be implicated in these observations because it is associated with the increased erythropoietin hormone which is responsible for hematopoiesis with red blood cells metabolism (Karadenizi *et al*., 2008). Apparently, beneficial effect of ascorbic acid supplementation would be most expressed under stressful conditions that affect PCV (Vathana *et al*., 2002).

The effect of carnitine and ascorbic acid supplementation caused significant increase of total protein, it could be attributed to effect of carnitine which plays an important role in fat lysis with protein biosynthesis. This observation is inconsistent with (Al-Khafagy, 2016, Al-Shamary and Fahad, 2017b).

Ascorbic acid is associated with increase total protein in ducks due to its major role in biosynthesis corticosterone and thus could be a useful stress management strategy. Carnitine and ascorbic acid as feed supplements for ducks reduced blood cholesterol and glucose, Carnitine facilitates fatty acids oxidation to produce energy, then Carnitine acts to reduce fatty acids by esterification, converting it to triacylglycerol which is stored in adipose tissues (Lee *et al*., 2004, Parasaeimehr *et al*., 2014).

Ascorbic acid could reduce blood cholesterol due to activation of the thyroid gland (Abdul-Rahman and Al-Katan, 2000, Fahad and Al-khafagy, 2017). It could be concluded that inclusion of carnitine with

Table 6: Effect of supplementing carnitine and ascorbic acid on some blood Parameters of ducks.

Treatment	PVC%	Total Protein (gm/100ml)	Cholestrol (gm/100ml)	Glucose (gm/100ml)
T_1: (Control)	1.49a	3.76a	2.61a	3.05a
T_2: (300 mg/kg) Carnitine	1.48b	2.17b	2.22b	2.35b
T_3: (300 mg/kg) Ascorbic A	1.09c	3.78c	2.18c	2.57c
T_4: (150 Carn. + 150 Abs. A)	0.97d	2.99d	2.05d	2.96d
Significance	*	*	*	*

* P<0.05, (Letters differ vertically mean significant differences).

ascorbic acid as feed supplements for ducks ameliorate the productive performance and some blood parameters such as PCV and total protein with reduction of cholesterol and glucose in pekin duck birds.

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