

Effect of Vitamin C, Red Pepper and Oak Leaves on Physiological and Productive Performance of Quail*

Ihsan T. TAYEB^{1**}, Saeb Younis ABDUL-RAHMAN², Narin Nidhamalddin SIDEEQ¹

¹Dohuk Polytechnic University, Amedi Technical Institute, Department of Animal Resources, Iraq

²University of Mosul, College of Agriculture and Forestry, Department of Animal Resources, Iraq

³Ministry of Education, Iraq

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ABSTRACT: The current study was conducted on the animal production college of agriculture and forestry-University of Duhok, in order to investigate the effect of ration supplementation with vitamin C, red pepper (RP) and oak leaves (OL) on some physiological, reproductive and productive parameters of quail. Four hundred eighty quail birds (7 days) were divided into four groups with three replicates / group (40 birds/replicate, the groups were treated from the age of 7 days till the age of 49 days as follows: T1 (control): Reread on standard ration, T2: Reread on standard ration supplemented with vitamin C(300mg /kg ration). T3: Reread on standard ration supplemented with red pepper crush (5g/kg ration). T4: Reread on standard ration supplemented with oak leaves crush (10g/kg ration).The results of the current study revealed the following: Significant increase in live body weight (LBW) and body weight gain (BWG) of treatment as compared with control, significant decrease in feed consumption (FC) in vit. C group as compared with control, a significant improvement feed conversion ratio (FCR) in OL group as compared with control and in RP and vit. C groups as compared with OL group, a significant decrease in carcass weight of RP group as compared with control and OL groups and in heart relative weight as compared with vit. C group. Significant increase in mean egg weight, hen day (HD) % and egg mass/hen in OL group as compared with control and in as compared with other treatments. Significant increase in serum total protein (TP) and globulin in OL group as compared with vit. C group and a significant decrease in serum albumin in RP group as compared with control of male quail and a significant decrease in serum TP, globulin, albumin and TG in all groups as compared with control of female quail, a significant decrease in Cholesterol in OL group compared with control and in glucose as compared with RP and vit. C groups. Significant improvement in Lymphocyt (L)%, Heterophil (H)% and stress index in OL group of female quail and in L% and in H% in vit. C group of male quail significant improvement in yolk index in OL group and in shell membrane thickness in control group.

Key words: Oak leaves, Quail, Production, Red pepper and Vitamin C

INTRODUCTION

Recently there has been an increased demand on white meat and eggs protein due to their nutritional value and health benefits as compared with red meat, and it is considered an important source of nutrition for human beings. It is well known that poultry nutrition is one of the most important factor that affect growth, immunity and quality of chick offspring (Kidd et al. 2003). In poultry industry, the intensive programs of production lead to great stresses on birds, and cause a negative impact on growth, and immunity due to the alterations in physiological and hormonal performance (Donker et al. 1990). Poultry production is also subjected to many problems such as the high initial cost of chick, high nutritional cost, management, the use of vaccine and antibiotics. As a solution to these problems a new products (species) as the quail was introduced in poultry industry. The quail is characterized by being a dual purpose bird and highly resistant to diseases and environmental condition without the use of vaccines, as well as, the high nutritional value of quail meat and eggs that was used to solve some of the above problems.

Vitamin C (L-ascorbic acid, AA) has an important metabolic role as a result of its reducing properties and functions as an electron carrier (Whitehead and Keller, 2003). AA can be synthesized by poultry (Lin et al. 2006) but the endogenous source of AA may not be adequate to meet the full needs of poultry at all times and/or the requirement for AA maybe increased under stressful conditions, like rapid growth and intensive egg production (Whitehead and Keller, 2003; Abdul-Rahman and Alrahawi, 2012). Medicinal plants and herbs has taken great attention for their antioxidant capacity, and are used in poultry industry to improve the physiological, productive and reproductive performance (Barreto et al. 2008; Taha and Abdul- Rahman, 2011; Al-krad et al. 2012; Abdul-Rahman and Alobaidy, 2013 and Abdul- Rahman and Al-Kattan, 2013;).

Red pepper, a plant belongs to the family (solanaceae) enhances immunity in rats (Akimoto et al. 2009), reduces blood sugar in dogs (Tolan et al. 2001) and in broiler (Ibrahim and Potros, 2009), It also improves the antioxidant status in rabbits (Alishlash, 2012).

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**Corresponding author: Tayeb, I.T., ihsan.tayeb@hotmail.com

Oak tree species are rich in phenolic compounds as galic acid and ellagic acid (Fernandez et al. 1996). Few studies are concerned with the physiological effects of oak leaves, Abdul- Rahman et al. (2001) evaluated the hypoglycemic and hypocholesterolemic effect of oak leaves boiled extract in chicken, and Abdul- Rahman et al. (2005); and Abdul- Rahman, (2008) studied the oak leaves boiled extract effect in rabbits.

The current study aim is to evaluate the effect of Vitamin C, Red pepper and oak leaves on some physiological, productive and reproductive performance aspects of quails.

MATERIALS and METHODS

The study was conducted in the Animal Production department, Faculty of Agriculture, University of Duhok, to investigate the effect of ration supplementation with Vitamin C, Red pepper and Oak leaves on some physiological reproductive and productive performance aspects of quails. A total of 800 fertile eggs were placed in the incubators machines. At the age of (7days), 480 birds were divided randomly into four groups (120 birds/group). With three replicates/group (40 birds/ replicate). The four groups were treated as follows from the age of 7days till the age of 49 days (for 6 weeks): T1: Birds were reared on the standard ration (control group). T2: Birds were reared on the standard ration supplemented with vitamin C (300 mg /kg ration). T3: Birds were reared on the standard ration supplemented with red pepper crush (5 g/ kg ration). T4: Birds were reared on the standard ration supplemented with oak leaves crush (10 gm/ kg ration). The feed was supplied manually through the

experimental period, the birds were fed two rations, starter ration (1-21days) and grower and productive ration (22 days- end of experiment). The two rations that used for birds feeding were explained in table (1).

Through the experiments this parameter was measured live body weight, weekly weight gain, feed intake, feed conversion ratio and egg production. At the age of 49 days birds were slaughtered, blood were collected, dressing percentage, H/L ratio, total protein, serum albumin, globulin, serum glucose, triglyceride, cholesterol. The experiment was designed by C.R.D and the collected data were analyzed by one-way analysis of variance using SAS (SAS, 2008). Then Duncan multiple range test (Duncan 1955) was used to determine the differences between means.

RESULTS and DISCUSSIONS

Table 2 reveals the effect of vitamin C, red pepper, oak leaves on body weight of quail, in the (1, 2, 3) weeks of treatment and there was a significant increase in body weight compared to control group. Table 3 shows that oak leaves treatment causes a significant increase on weight gain at the first week as compared with control, red pepper treatment causes a significant increase in weight gain at the third week of treatment as compared with control at (p 0.05).

Table 4 reveals a significant increase in feed consumption on the first and second weeks of treatment in oak leaves group and control group as compared with vitamin C, a significant increase in oak leaves group on the third week of treatment as compared with control group at (p 0.05).

Table 1. Chemical analysis of quail rations during the experimental

Ingredient%	Rations	
	Starter	Growth and production
Yellow corn	36	42
Wheat	22	22
Soybean meal (44%)	35	30
Protein concentration	5	4
Sunflower oil	1	1
Limestone (Ca+2)	0.7	0.7
Salt	0.3	0.3
Total	100	100
Chemical composition % (calculated) as feed		
Crude protein	23.670	21.590
ME(cal/kg)	2861.800	2895.600
Dry matter	90.410	89.980
Ether extract	3.140	3.310
Crude fiber	4.050	3.780
Lysine	1.378	1.210
Methionine	0.572	0.515
Meth. + Cys.	0.871	0.786
Calcium	0.507	0.456
Phosphorous	0.274	0.214

*: Protein concentrates 40%: Table 3.

** : Calculated from NRC. 1994. (Appendix 2)

Table 5 shows a significant decrease (improvement) in F.C.R. on the first week of treatment in oak leaves group was observed as compared with control, in vitamin C and red pepper groups on the second week of treatment as compared with oak leaves group at (p 0.05).

The results of vitamin C on live body weight (LBW) and FCR were in agreement with the finding of Usman et al., (2008); Abdul-Rahman and Al-Rahawi 2012); Tuleun et al. (2011); Al-krad et al. 2012 and Abdul-Majeed, (2013) in quails. Whereas the results in WG were in agreement with Abdul-Rahman and Al-Rahawi 2012; Al-krad et al. (2012) and Abdul-Majeed, (2013) in quail.

The results on FC were in agreement with the findings of Al-Rahawi, 2010 in quail, with those of Puthpong siriporn et al. (2001) and Mbajiorgu, (2011) in laying hens and also with the finding of Konca et al. (2009); Tayeb et al. (2011) and Al-krad et al., (2012) in broiler. The effects of vitamin C may be due to the positive effect of vitamin C as antioxidant that enhanced the thyroid function (El-Fiky, 1998) and the protection of intestinal mucosal lining and the improvement of

digestive function in feed assimilation (Abdul-Majeed, 2013). On the other hand, the effect of red pepper on LBW, FC and were generally in agreement with the finding of (Barreto et al. 2008) who stated that the addition of red pepper to broiler diet did not affect LBW and FC, also the results of the current study in LBW specially in the second and third weeks of treatment were in agreement with (Alkassie et al. 2011) who reported a significant increase in WG of broiler when red pepper was added to the diet, while the results in FC and FCR were in disagreement with (Alkassie et al. 2011) finding who stated an improvement in FC and FCR when red pepper was added to broiler diet. The absence of obvious effects of red pepper on LBW, WG and FCR may be due to the active ingredient Capsaicin which increased energy utilization and fat metabolism (Smeets and Lejeune, 2005), Capsaicin enhances energy metabolisms and utilization through catecholamine secretion from adrenal medulla as a result of central nervous system activation which mediated through thermo- sensitive transient receptor potential (TRP) type V1 (Kobata et al. 2006).

Table 2. The effect of Vitamin C, Red pepper and Oak leaves on body weight (gm) of quail

Treatments	Initial body weight (7days)	Weeks of treatment				
		1 st (14 days)	2 nd	3 rd	4 th	5 th
Control	37.09±0.45 ^a	74.83±3.36 ^b	126.46±0.89 ^b	167.33±0.46 ^c	209.41±1.58 ^a	226.28±1.53 ^a
Vit. C 300 mg /Kg ration	37.93±0.88 ^a	81.00±1.59 ^{ab}	129.87±2.05 ^{ab}	172.75±1.60 ^{ab}	213.62±3.56 ^a	228.62±3.38 ^a
Red pepper 5g/Kg ration	38.22±0.12 ^a	81.54±0.30 ^{ab}	131.67±0.79 ^a	175.08± 0.60 ^a	213.00±2.04 ^a	232.54±0.47 ^a
Oak leaves 10 gm/kg ration	37.32±0.43 ^a	85.71±2.83 ^a	129.62±1.48 ^b	171.33±0.84 ^b	213.33±1.62 ^a	226.28±2.55 ^a

Values represent: means ± SE.

Different letters in each column mean significant differences at (P 0.05).

Table 3. The effect of vitamin c, red pepper and oak leaves on weight gain (gm/ bird / week) of quail

Treatments	Weeks of treatment					accumulative weight gain
	1 st (14d)	2 nd	3 rd	4 th	5 th	
Control	37.74±3.60 ^b	51.62±2.90 ^a	40.87±0.43 ^b	42.08±1.16 ^a	16.86±0.76 ^a	189.19±1.51 ^a
Vit. C 300 mg/Kg ration	43.06±0.71 ^{ab}	48.87±2.03 ^a	42.87±0.56 ^{ab}	40.87±2.34 ^a	15.00±0.18 ^a	190.69±2.57 ^a
Red pepper 5gm/Kg ration	43.32±0.42 ^{ab}	50.12±0.92 ^a	43.42±0.25 ^a	37.91±1.44 ^a	19.54±2.49 ^a	194.32±0.55 ^a
Oak leaves 10 gm/kg ration	48.39±2.89 ^a	43.91±4.23 ^a	41.71±1.10 ^{ab}	42.00±2.31 ^a	13.35±3.78 ^a	189.37±2.98 ^a

Values represent: means ± SE.

Different letters in each column mean significant differences at (P 0.05).

Table 4. The effect of vitamin C, red pepper and oak leaves on feed consumption (gm/week/bird) of quail

Treatments	Weeks of treatment					
	1 st (14d)	2 nd	3 rd	4 th	5 th	6 th
Control	120.08±1.80 _a	150.03±5.96 _a	148.00±1.37 _b	181.37±4.40 _a	180.17±16.4 _{5^a}	181.83±4.57 ^a
Vit.C300 mg/Kg ration	111.04±2.56 _b	120.04±4.62 _b	152.33±1.37 _{ab}	175.54±4.75 _a	189.22±9.65 _a	181.71±13.39 ^a
Red pepper 5gm/Kg ration	116.88±1.90 _{ab}	128.58±10.0 _{3^{ab}}	154.00±2.59 _{ab}	184.96±4.80 _a	181.08±4.45 _a	190.50±4.45 ^a
Oak leaves 10 gm/kg ration	120.96±1.77 _a	145.37±4.19 _a	155.25±2.09 _a	183.71±3.33 _a	174.18±3.34 _a	187.50±5.62 ^a

Values represent: means ± SE.

Different letters in each column mean significant differences at (P 0.05).

In the current study, the supplementation of oak leaves crush in a level of 1% with the quail diet did not exhibit any passive effects on LBW, WG, FC and FCR, This may reflect the palatability of oak leaves and that the birds accepted the flavor and taste of the leaves and did not refuse the diet so that the growth parameters

were in normal ranges, The oak leaves were used previously for goat, sheep and cattle nutrition without any adverse effects (Paterson, 1993) and Lupton et al. (1996) too stated that rearing goats on the oak leaves enhance WG.

Table 5. The effect of vitamin C, red pepper and oak leaves on feed conversion ratio of quail

Treatments	Weeks			
	1 st (14 d)	2 nd	3 rd	4 th
Control	3.25±0.39 ^a	2.93±0.23 ^{ab}	3.62±0.05 ^a	4.32±0.19 ^a
Vit. C 300 mg/Kg ration	2.57±0.03 ^{ab}	2.46±0.10 ^b	3.55±0.07 ^a	4.31±0.16 ^a
Red pepper 5gm/Kg ration	2.70±0.07 ^{ab}	2.56±0.15 ^b	3.55±0.07 ^a	4.88±0.06 ^a
Oak leaves 10gm/kg ration	2.51±0.11 ^b	3.36±0.27 ^a	3.73±0.13 ^a	4.41±0.33 ^a

Values represent: means ± SE.

Different letters in each column mean significant differences at (P 0.05).

Table 6 represents the effect of treatment on egg production parameters for the period (42days age to 49 days age). The results also showed a significant increase in egg number/week in red pepper treatment group as compared with oak leaves and vitamin C treatments and a significant increase in mean egg weight was recorded in oak leaves group as compared with control group at (p 0.05). The result revealed a significant increase in HD% and egg mass in oak leaves group as compared with red pepper group, vitamin C group and control group, The HD% and egg mass value in vitamin C group were significantly better than that of control group at (p 0.05). On the other hand, vitamin C, red pepper and oak leaves treatments improved the F.C.R. and the values of F.C.R. in oak leaves group were significantly improved as compared with control group at (p 0.05). The results were in agreement with the

finding of (Hemid *et al.* 2010 and Abdul-Majeed, 2013) home reported the positive effect of vitamin C on HD% and egg mass may be due to the inhibitory effect of vitamin C on the stress hormone (corticosterone), the addition of vitamin C to quail diet caused a significant decrease in corticosterone level. There was a negative correlation between corticosterone and the gonadotropins (LH and FSH), so the gonadotropin would enhance ovary growth and function (Erhan and Bölükba i, 2011). In regard to the oak leaves effects that improved significantly the egg weight, HD%, egg mass and FCR Table 8. This may reflect the palatability of oak leaves and their enhancement of the digestive system function in feed assimilation, also the role of oak leaves constituents as the polyphenols gallic and ellagic acids that possessed antioxidant activities (Zoi Papoutsis et al. 2005).

Table 6. The effect of Vitamin C, Red pepper and Oak leaves on egg production parameters of quail

Age 42 days - 49 days							
Treatments	Egg number/week	Egg weight/ week(gm)	Mean egg weight (gm)	HD%	Egg mass gm /hen/ day	FC (gm)	FCR
Control	85.00±2.51ab	898.93±37.59a	10.57±0.18b	58.72±0.81c	6.20±0.18c	3460.75±151.58a	3.90±0.07a
Vit. C 300mg / Kg ration	81.33±2.02b	885.06±33.51a	10.87±0.18ab	62.23±0.88b	6.76±0.21b	3154.50±280.45a	3.56±0.31ab
Red pepper gm/kg ration	88.66±1.76a	968.78±21.59a	10.92±0.04ab	61.29±0.79cb	6.69±0.08cb	3538.67±65.00a	3.65±0.05ab
Oak leaves 10 gm/kg ration	80.33±0.88b	900.36±6.49a	11.21±0.12a	64.98±0.83a	7.27±0.10a	2943.50±109.68a	3.26±0.10b

Values represent: means ± SE.

Different letters in each column mean significant differences at (P 0.05).

Table 7 revealed a significant increase at (p 0.05) in carcass weight in oak leaves group as compared with red pepper which was significantly decreased as compared with control group and significant increase in heart % in vitamin C group as compared with red pepper group at (p 0.05). The results of Vit. C on carcass and internal organs were in agreement with those of (Abdul-Rahman and Al-Rahawi 2012; Abdul-Majeed, 2013) may due to the stress of growth and rapid productivity of quail (egg laying) by the reaction of vit. C with the reactive oxygen species, mainly the superoxide anion radical, hydroxyl radical and hydrogen peroxide, forming semidehydroascorbic acid and this will protect tissues from oxidative damage (Tayeb et al., 2011).

Table 8 and 9 shows a significant increase in lymphocyte % of male quail in vitamin C group as compared with control, red pepper and oak leaves treatment and of female quail in oak leaves group as compared with vitamin C group at (p 0.05). There was

also a significant decrease in heterophil % of male in vitamin C group as compared with control, red pepper and of female quail in oak leaves group as compared with control and vitamin C. On the other hand, monocyte % of female quail was significantly increased in red pepper group as compared with control group at (p 0.05). In regard the stress index oak leaves treatment caused a significant decrease in female quail as compared with control and vitamin C. The result of vitamin C on differential leucocytes counts (DLC) was in agreement with (Al-krad et al. 2012) and (Abdul-Majeed, 2013), specially for the Lymphocytes % and Heterophil % and a disagreement with the two above mentioned researchers in H/L ratio. The results of red pepper were in agreement with the finding of (Akimoto et al. 2009 and Alkassie et al. 2011) in rat especially in basophils % and eosinophils % and monocytes %.

Table 7. The effect of Vitamin C, Red pepper and Oak leaves on some carcass parameters of female quail

Treatments	Live body weight (gm)	Carcass weight (gm)	Dressing %	Liver%	Heart%	Pancreas %	Gizzard %
Control	264.33±8.13a	196.68±0.56 a	74.72±2.07a	2.89±0.36a	0.72±0.02ab	0.19±0.01a	1.79±0.12a
Vit. C 300 mg /Kg ration	259.33±3.39a	192.24±2.22 ab	74.09±0.55a	2.53±0.16a	0.82±0.05a	0.19±0.01a	1.75±0.16a
Red pepper 5gm/Kg ration	250.00±5.11a	183.30±3.83 b	73.32±0.03a	2.94±0.33a	0.69±0.03b	0.19±0.02a	1.73±0.07a
Oak leaves 10 gm/kg ration	270.66±11.7a	200.69±6.70 a	74.32±0.86a	2.35±0.04a	0.80±0.02ab	0.23±0.02a	1.77±0.11a

Values represent: means ± SE.

Different letters in each column means significant differences at (P 0.05).

Table 8. The effect of Vitamin C, red pepper and oak leaves on differential leucocyte counts of male quail

Treatments	Lymphocyt %	Heterophil %	Monocyte %	Eosinophil %	Basophil %	Stress index %
Control	72.00±2.11b	26.16±1.77a	1.33±0.44a	0.66±0.33a	0.00±0.00a	0.36±0.03a
Vit. C 300 mg/Kg ration	77.83±2.24a	20.16±1.68b	1.16±0.47a	0.83±0.40a	0.00±0.00a	0.26±0.02a
Red pepper 5gm/Kg ration	72.16±1.88b	25.16±1.51a	1.50±0.50a	1.16±0.47a	0.00±0.00a	0.35±0.02a
Oak leaves 10 gm/kg ration	71.50±0.95b	26.00±0.46a	1.66±0.42a	0.83±0.30a	0.00±0.00a	0.36±0.01a

Values represent: means ± SE.

Different letters in each column means significant differences at (P 0.05).

Table 9. The effect of Vitamin C, Red pepper and Oak leaves on differential leucocyte counts of female quail

Treatments	Lymphocyt %	Heterophil %	Monocyte %	Eosinophil %	Basophil %	Stress index %
Control	72.50±1.89ab	26.50±1.66a	0.83±0.16b	0.33±0.33b	0.00±0.00a	0.37±0.03a
Vit. C 300 mg/Kg ration	70.33±1.08b	26.50±0.88a	1.66±0.33ab	1.50±0.22a	0.00±0.00a	0.37±0.01a
Red pepper 5 gm/Kg ration	74.33±1.62ab	22.50±1.92ab	1.83±0.30a	1.33±0.21a	0.00±0.00a	0.30±0.03ab
Oak leaves 10 gm/kg ration	75.33±1.22a	21.50±1.25b	1.66±0.33ab	1.66±0.30a	0.00±0.00a	0.28±0.02b

Values represent: means ± SE.

Different letters in each column mean significant differences at (P 0.05).

Table 10 explain the effect of vit.C, red pepper and oak leaves on blood serum of male quail, the table showed a significant increase (p 0.05) in serum total protein and globulin, in oak leaves as compared with vitamin C and a significant decrease (p 0.05), in albumin in red pepper group as compared with control group of male quail.

Table 11 explains the effect of vitamin C, red pepper and oak leaves on blood serum of female quail. There was a significant decrease (p 0.05) in total protein, in albumin and triglyceride in vitamin C, red pepper and oak leaves treatment respectively as compared with control. There was also a significant decrease in Alb in red pepper group compared with oak leaves group., and there was a significant decrease in Glob in oak leaves group as compared with control and red pepper and a significant decrease (p 0.05) in vitamin C compared with control. Treatment also causes a significant reduction (p 0.05) in Chol. level, and in oak leaves group Chol. has been significantly decreased as compared with control. T.g has also been

significantly decreased (p 0.05) in oak leaves as compared with vitamin C and red pepper and T.g in vitamin C has been significantly decreased (p 0.05) as compared with red pepper group. On the other hand, Glu. is significantly increased (p 0.05) in red pepper group as compared with oak leaves and control at (p 0.05). The effects of vitamin C on triglyceride (TG) of female quail were in agreement with the finding of (Al-krad et al. 2012 and Abdul-Majeed, 2013), but they were in disagreement with (Abdul-Rahman and Alrahawi, 2012) in regard to the globulin and globulin: albumin ratio. The addition of vitamin C to the quail diet inhibited the stress hormone corticosterone (Abdul-Majeed, 2013). The results of red pepper on TP and Alb in female quail and on Alb in male quails were disagreement with the findings of (Trasel et al., 2010) in broiler and with (Abdel-Azim et al., 2009) in Mascovy ducks, These results may be due to the difference in the experimental animal (quail: egg laying) and in duration of the experiment.

Table 10. The effect of Vitamin C, Red pepper and Oak leaves on blood serum biochemical parameters of male quail.

Treatments	Tp gm/dl	Alb gm/dl	Glob gm/dl	Chol mg/dl	Tg mg/dl	Glu mg/dl
Control	2.97±0.18ab	2.06±0.11a	0.91±0.09ab	156.40±13.34a	215.40±15.01a	345.52±10.76a
Vit. C 300 mg/Kg ration	2.53±0.13b	1.85±0.03ab	0.68±0.10b	145.28±3.73a	214.32±4.20a	313.17±24.37a
Red pepper 5gm/Kg ration	2.71±0.11ab	1.76±0.08b	0.95±0.11ab	155.95±7.90a	199.22±2.89a	329.94±9.21a
Oak leaves 10 gm/kg ration	3.10±0.15a	1.84±0.10ab	1.25±0.21a	161.54±14.47a	193.14±9.43a	354.56±9.37a

Values represent: means ± SE.

Different letters in each column means significant differences at (P 0.05).

*Tp: total protein, Alb: albumin, Glob: globulin, Chol: cholesterol, T.g: triglyceride, Glu: glucose

Table 11. The effect of Vitamin C, Red pepper and Oak leaves on blood serum biochemical parameters of female quail

Treatments	Tp gm/dl	Alb gm/dl	Glob gm/dl	Chol mg/dl	T.g mg/dl	Glu mg/dl
Control	4.65±0.50a	3.04±0.03a	1.62±0.08a	150.53±7.96a	1236±37.06a	287.79±17.66bc
Vit. C 300mg/Kgration	3.47±0.07b	2.30±0.11bc	1.16±2.39bc	132.18±2.39ab	957.78±24.67c	328.38±8.14ab
Red pepper 5gm/Kg ration	3.50±0.09b	2.16±0.04c	1.34±0.08ab	139.89±10.32ab	1120.37±22.36b	345±15.76a
Oak leaves 10 gm/kg ration	3.40±0.18b	2.53±0.17b	0.87±0.14c	127.87±4.17b	816.81±58.38d	270.80±15.18c

Values represent: means ± SE.

Different letters in each column means significant differences at (P 0.05).

*Tp: total protein, Alb: albumin, Glob: globulin, Chol: cholesterol, T.g: triglyceride, Glu: glucose.

CONCLUSION

The absence of any passive effects on the nutritional parameters (LBW, FC and FCR) due to the ration supplementation with red pepper and oak leaves indicate the palatability and the acceptance of these plants by the quail, and that these plants have no negative effects on food assimilation. Oak leaves treatment has the better effects on egg production parameters. Adding vitamin C to the quail diet improves its physiological hygiene.

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