EFFICACY OF OVERDOSING OF VITAMIN D3 SUPPLEMENTATION ON GROWTH PERFORMANCE AND SOME BLOOD CONSTITUENTS OF JAPANESE QUAIL

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SUMMARY

The present study was designed to investigate the efficacy of overdosing of vitamin D3 supplementation on growth performance, carcass parameters and some blood constituents of Japanese quail in one way analysis of variance experiment lasted in 49 days of age. Two hundred and twenty five of one day old of Japanese quail chicks were used. The chicks were distributed into 5 treatments of 3 replicates of 15 birds each. Five levels of vitamin D3 (0, 1500, 3000, 4500 and 6000 ICU/kg diet) were used. The body weight and feed intake were recorded weekly and consequently, body weight gain and feed conversion ratio were calculated. At the end of the experiment, three birds from each group were slaughtered to evaluate carcass parts. Blood serum samples were obtained from chicks at 49 days of age after centrifuged to measure total protein, cholesterol, glucose, calcium, phosphorus and GPT. At 49 days of age, the results showed that, the Japanese quail fed the highest level of vitamin D3 (6000 ICU/kg diet) achieved significantly (P<0.05) the highest body weight and body weight gain and the best feed conversion ratio. No significant (P>0.05) effects due to vitamin D3 supplementation were noticed in dressed% and some blood serum parameters were measured. It was recommended that under the present experimental conditions, the overdose of vitamin D3 (6000 ICU/kg diet) achieved higher growth performance and some carcass traits of Japanese quail.

Keywords: Quail, overdose, vitamin D3, growth performance and carcass.

INTRODUCTION

The shortage of animal protein intake among the ever increasing human population in the third world countries has long been recognized and remains one of the greatest issues of concern today (Omoikhoje *et al.*, 2008). Developing Countries including Egypt are deficient in animal protein security with the per capita consumption put at lower than 10.0 g/per day as against the minimum daily intake of 35 g recommended by Food and Agricultural Organization to be the minimum requirement for the growth and development of the body (Esobhawan *et al.,* 2008).One way of increasing protein supply is to improve poultry production as well as increase the production of other small livestock species with short generation intervals. Among these is the Japanese quail (Coturnix Coturnix Japanica).Generally quail occupy a small but special segment of the Egyptian poultry industry. These birds are raised as source of specialty egg and meat. Japanese quail have the advantage of rapid growth rate, small size, good reproductive potential, short life cycle, low feed requirements, good meat taste, better laying ability and shorter time of hatching as compared with the different species of poultry (Roshdy *et al.*, 2010 and Siyadati *et al.*, 2011).

Vitamin D_3 plays many important functions in the animal, as it is necessary for proper calcium (Ca) absorption and use in different biological processes. The modern high-performing poultry requirement for supplemental vitamin D to maximize mineral digestibility, performance and immunity indices, bone health, and eggshell quality is about 3,000 IU/kg, i.e. much higher than NRC (1994) recommendations.

Nuhriawangsa *et al.,* (2015) found that production performance was not significant at the levels treatment of vitamin D3 on research diets of laying quail. Production performance on 0, 500, 1.000, 1.500 and 2.000 mg/kg had same results that did not significuntly different. Several studies on poultry showed similar results. Diets containing cholcalciferol (vitamin D3) with concentration 0 and 75 mg/kg-1 did not significantly effect on FC and FCR of duck (Onyango and Adeola . 2012). Weight gain, feed

consumption (FC) and FCR of broiler chickens with phosphorus deficiency and added phytase and 1α (OH) D_3 did not significantly difference (Driver *et al*, 2005). Feed consumption, egg production and egg weight of laying hens did not differ with addition phytase and 1, 25-$(OH)_2D_3$ (Carlos and Edwards, 1998).

The aim of the present experiment was to evaluate the efficacy of overdosing vitamin D3 supplementation on growth performance, Europe production efficiency factor (EPEF),carcass traits and some blood constituents of Japanese quail.

MATERIALS AND METHODS

The present study was carried out at the Poultry Research Farm of Department of Poultry Production at Assiut University. The objective of the present study was to investigate the efficacy of overdosing of vitamin D3 supplementation on growth performance, Europe production efficiency factor (EPEF),carcass traits and some blood constituents of Japanese quail.

Housing and experimental design:

A total number of (two hundred and twenty five, one day old Japanese quail chicks) were used in this experiment. The chicks were distributed into 5 treatments of 3 replicates (15 birds each). The experimental diets based on corn –soybean meal and contain 24 and 20% crude protein during starter and grower periods, respectively according to NRC 1994, recommendation).The ingredient composition and chemical analysis of the experimental diets used in the starting and growing period are presented in Table (1). Samples of the experimental diets were analyzed according to AOAC (1990). The experimental design was as follows:

Treatment 1: Chicks were fed basal diet (control) containing 2200 ICU vitamin D3/kg feed; Treatment 2:Chicks were fed basal diet supplemented with 1500 ICU of Vit. D3/kg feed; Treatment 3: Chicks were fed basal diet supplemented with 3000 ICU of Vit. D3/kg feed; Treatment 4: Chicks were fed basal diet supplemented with 4500 ICU of Vit. D3/kg feed; Treatment 5: Chicks were fed basel diet supplemented with 6000 ICU of Vit.D3/kg feed.

The experimental chicks were housed in galvanized batteries composed of three tiers, equipped with cages, having the dimensions of (75 cm length, 50 cm width and 45 cm height) and placed in a semi closed house. Chicks were raised under adequate and similar managerial, nutritional and hygienic conditions.

Chicks were exposed during the first three days of age to a lighting period of 23 hr./day, which was gradually decreased by 1hr/day to reach 12L: 12D hours/day during the rest of the growing period.

Body weight was recorded at one day old and each week per each replicate till 7 weeks.. Also, feed consumed was recorded each week till the last of the experiment. Body weight gain and feed conversion were calculated during the period from 0-7, 0-14, 0-21, 0-28, 0-35, 0-42 and 0-49 days of age. Mortality was recorded daily. At last of the experiment, three chicks from each replicate (total 45 chicks) were taken to slaughter to measure carcass parts. After complete bleeding, scalding and plucking, the edible organs (heart, liver), breast, thigh, weighed and estimated as percentage of the live body weight. The dressing percentage was estimated by dividing the weight of the carcass giblets on the pre-slaughter body weight of birds.

Criteria studied:

Body weight development, body weight gain and feed intake of quail birds in different groups were weekly recorded. Body weight gain and feed conversion ratio (FCR) and were calculated according to McDonald *et al.* (1987) and North (1981) respectively.

Depend on the calculations of FI, BWG and FCR and mortality, the European Production Efficiency Factor (EPEF) and European Broiler Index (EBI) were used to evaluate the growing performance of broilers as suggested by Marcu*et al*. (2013). EPEF and EBI were calculated according to the following formula:
TWG (Total weight gain)= Body weight (g) at the end ― Body weight (g) at start;
ADG (Average daily gain, g/chick/day) = TWG/ days of growth period.
FCR (kg feed/kg gain) = Cumulative feed intake (kg) /Total Weight gain (kg);
Viability, % = 100 - mortality, %

EPEF= Viability (%) x BW (kg)*100/Age (d) x FCR (kg Feed / kg gain)
EBI = Viability (%) x ADG (g/chick/day)*100 /FCR (kg feed/kg gain) x 10

Carcass characteristic:

At the end of the experimental period, 5 chicks from each group were randomly selected and scarified to calculate the dressing percentages, also, to collect some edible organs and relative weight of each organ was calculated as follows: Relative weights = (organ weight/Live body weight) X 100.

Blood samples:

At the end of the experimental period, blood samples were taken using 3 birds from each replicate. The blood samples were left to drop on the side of the tube to prevent destruction of RBCs. Each blood sample was left to coagulate at room temperature. Separation of serum was carried out by centrifugation of coagulated blood at 3000 rpm for 10 min. The clear serum was transferred carefully to clean and dry vials and kept in deep freezer until analysis for determination of serum glucose, total protein, calcium, phosphorus, total cholesterol and GPT using commercial kits obtained from Biodiagnostic Co.

Statistical analysis:

Data obtained were statistically analyzed by using ANOVA and General linear Model (GLM) procedure of SAS (2009) software (version9.2.2). Duncan's multiple range   tests (1955), was used to determine the difference among means, when the treatment effects were significant. Significant difference were considered to exist when (P<0.05).

The mathematical model used was:

$$Y_i = \mu + T_i + e_{ik}$$

Where: Y_{iK} is any abservation by vit D3, μ=the population mean, T_i= Treatment effect (i=1,2, ... 5) e_{ik}=Experimental random error.

RESULTS AND DISCUSSION

Body weight (BW), Body weight gain (BWG), Feed consumption (FC), Feed conversion ratio (FCR) and mortality rate (MR):

The results of body weight and body weight gain as affected by vitamin D3 levels are presented in (Table 2, 3). There were significant differences due to vitamins D3 levels at 7 weeks of age in body weight and body weight gain of Japanese quail. The highest body weight value was in treatment 4, in which chicks were fed 6000 ICU/kg of vitamin D3, followed by treatments 1,3,0, in which chicks were fed 1,500, 4,500, and zero ICU/kg of Vitamin D3 respectively, and the lowest body weight value for treatment 2, in which chicks were fed 3,000 IU of Vitamin D3.No significant (P>0.05) differences were observed in body weights and body weight gain at one, two, three, four, five and six week of age. The obtained results are in disagreement with that reported by Perine   *et al.* (2016) who found that in meat-type quail (*Coturnix Coturnix sp*) between 15 and 35 days old, body weight and body weight gain increased linearly with the four levels of vitamin D :1000; 2,000 ; 3,000; and 4,000 ICU. Sahin   *et al* (2009) reported that improved performance of laying   Japanese quail reared under heat stress when birds were supplemented with 25-OH-D3 and soy isoflavones.

The results of feed consumption as affected by vitamin D3 levels are   presented in   (Table 4). There were significant differences due to vitamins D3 levels in the period of (0-14 days) of age, The highest feed consumption value was for treatment 0 (control diets), followed by   treatments 4.1, and 3 in which chicks were fed 6000, 1500, and 4500 ICU/kg vtamin D3 respectively, while the lowest body weight gain value for treatment 2, in which chicks were fed 3,000 ICU/kg of vitamin D3. Also, there were significant differences due to vitamin D levels in the period of (0-21 days) of age , the highest feed consumption value was in chicks fed 4500 ICU of vitamin D3/kg feed followed by treatments, in which chicks were fed 0, 3000, and 1500 ICU of vitamin D3/kg feed, respectively, while the lowest feed consumption (FC)   value was for treatment 4, in which chicks were fed 6,000 ICU/kg of vitamin D3.These results are in agreement with Perine *et al.* (2016) who reported that the increased vitamin D levels resulted in a linear increase in feed intake. Marques   *et al.* (2011) found that feed intake increased significantly with the vitamin D supplementation.

In the period of (0-7, 0-28, 0-35, 0-42 and 0-49 days of age) there were no significant differences in FC between treatments fed basal diet supplemented with the different levels of vitamin D$_3$/kg.

The results of feed conversion as affected by vitamin D3 levels are presented in (Table 5). There were significant differences due to vitamin D3 levels in the period (0-49 days) of age, The best feed conversion ratio (FCR) value was in treatment 4, in which chicks were fed the highest dose of vitamin D3 (6000 ICU/kg) of vitamin D3, followed by treatments in which chicks were fed 1500, 4500, 0 and 3000 ICU/kg of vitamin D3, respectively. The obtained results are in agreement with the findings of Fatahi *et al.* (2019)who found that feed conversion ratio were influenced by levels of vitamin D3 (P< 0.05), the feed conversion ratio in 4000 ICU/kg of vitamin D3 (3. 68) was significantly better than the control (4. 22). Perine *et al* (2016) found that feed conversion ratio showed some linear improvement due to increased levels of Ca and vitamin D.In the periods of 0-7, 0-14, 0-21, 0-28, 0-35 and 0-42 days of age, no significant differences in feed conversion ratio were observed between treatments due to vitamin D3 supplementation.

No mortalities were recorded on quail due to vitamin D3 supplementation during the experimental periods.

European production efficiency factor (EPEF) and European broiler index (EBI).

Date presented in Table (6), showed the Europe Production efficiency Factor (EPEF) and Europe Broiler Index (EPI) values of Japanese quail during the period from one day old to 49 days of age. The results of EPEF and EPI showed that the overdose of vitamin D3 supplementation achieved the highest performance values of EPEF and EPI (547.07) and (1073.63) compared to the other doses of vitamin D3 and control chicks, respectively.

If for instance a very low density is used during the grow-out period, the daily gain and with it the EBI will most likely go up, but the profit per square meter will go down, and the last one is economically of more interest.

If a low density, cheap feed is used, the daily growth and feed conversion might be negatively influenced, and with it the EBI, but the net profit per kg of meat might go up.

Efficacy of overdosing of vitamin D3 supplementation on carcass traits of Japanese quail:

The results of carcass traits as affected by vitamin D3 levels are presented in (Table 7). There were no significant differences due to vitamin D3levels in the breast, thigh, liver and dressing percentages.

Our findings are in agreement with that reported by Perine *et al.* (2016) who observed that calcium and vitamin D3 levels did not have significant effects (P>0.05) on carcass and cut yields. However, the same pattern was observed with WG and BW such that calcium and vitamin D levels led to a linear increase (P<0.05) in carcass weight, breast weight, and leg weight.

No significant differences (P>0.05) due to vitamin D3 levels on dressed, breast and thigh percentages were found. The same trend was achieved by Khan *et al.,* (2010) who showed that values of dressing percentage and breast meat yield in different groups indicated that there was no marked variation up to 1500 IU/kg vitamin D$_3$ supplementation. Statistical analysis showed insignificant results in the above parameters of broilers between 200 and 1500 ICU/kg of vitamin D levels.

Efficacy of overdosing of vitamin D3 supplementation on blood serum parameters of Japanese quail:

The results of blood serum parameters as affected by vitamin D3 levels are presented in (Table 8).There were no significant (P<0.05) differences due to vitamin D3 levels on the measured blood serum parameters including total protein, cholesterol, glucose, calcium, phosphorus and GPT . Slight variations among treatments were recorded in the mentioned parameters.

The same tends were noticed with Perine *et al.* (2016) who observed that with increased levels of dietary calcium the blood calcium levels (BLC) increased linearly (P<0.05) with the increase in dietary calcium levels and a Quadratic effect (P<0.05) was observed with the increase in vitamin D. Calcium and ash contents in the bone were not affected by the increase in calcium and vitamin D levels, because they were probably being mobilized to maintain the blood calcium levels, since they were crescent, because the bones are metabolically active tissues. Vitamin D stimulates absorption of dietary calcium from the intestine to maintain blood calcium level in normal values (Soares *et al.,* 1995; VanLeeuwen *et al.,* 2001). Han *et al.,* (2009) reported that 1α-OH-D$_3$ facilitate intestinal P absorption due to stimulating small intestinal NaPi-IIbcotransporter gene expression. Khan *et al.,* (2010) showed that the concentration of Ca and inorganic phosphorus (IP) in the serum was significantly depressed in broilers fed diet

contained vitamin D at 200 ICU/kg compared with those fed the diets contained its higher levels. Concentrations of these minerals in the serum increased progressively with the level of VIT-D3 supplementation to broiler diets at both 21 and 42 days of age.

Moreover, Bozkurt *et al*. (2017) reported that serum ionized Ca and Mg concentrations showed no response to dietary vitamin D. Han *et al.,* (2012) indicated that the dietary 1α-OH D3 decreased serum Ca dietary concentration. Also, the addition of 1 α-OH D3 showed a trend of increasing serum phosphorus concentration, but the difference was not significant.

Generally, vitamin D3 plays many important functions in the animal organism; among others, it is necessary for proper calcium (Ca) absorption and Ca use in different biological processes. Vitamin D3 is essential for the metabolism of calcium (Ca) and phosphorus (P) in birds. In the body, vitamin D3 is required for the absorption of calcium and phosphorus in the intestines, increasing its utilization efficiency and consequently increasing the bone ash density. Furthermore, vitamin D3 regulates the secretion of parathyroid hormone (PTH) and stimulates several tissues with vitamin D receptors (Norman, 1985). Therefore, vitamin D deficiency can further aggravate these factors, leading to decreased productivity and emergence of metabolic disorders. Studies suggest that vitamin D3 may also affect growth performance (Yarger *et al.,* 1995; Brito *et al.,* 2010) and meat quality in poultry (Han *et al.*, 2012) and colour (Wilborn *et al.*, 2004). Vitamin D supplementation increases the intestinal absorption of calcium and phosphorus, stimulating the production of calcium-binding proteins in the mucosa, which activates the calcium activated tenderisation (CAT) complex through the increase in plasma calcium. This complex regulates the enzymatic activity of calpain and other proteases involved in the process of meat tenderization (Santos, 2006).

The modern high-performing for supplemental vitamin D3 to maximize minerals, performance and immunity indices, bone health, and eggshell quality is about higher by 8 times (6000 ICU/kg diet) than NRC (1994) recommendations (750 ICU/kg diet). The results of recent quail study have shown that 25-hydroxycholecalciferol (25-OH-D3) is more efficient in commercial quail nutrition.

CONCLUSION

Based on the obtained results, it could be concluded that the overdose of vitamin D3 (6000 ICU/kg diet) achieved the highest good growth performance and some carcass traits compared to the other levels of vitamin D3 used. Therefore, it is preferable to overdose vitamin D3 in Japanese quail diets up to 6000 ICU/kg diet.

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Table (1): Composition and analysis of the experimental basal diets.

Item	Starter,%	Grower,%
Ingredients:		
Corn, Grains	53.00	62.0
Soybean Meal (44%)	36.20	30.2
Vegetable oil	1.00	1
Corn gluten Meal (60%)	6.40	3.4
Di calcium phosphate	2.05	2.05
Vit . Min. Premix[*]	0.30	0.3
Limestone	0.45	0.45
Na Cl	0.30	0.3
DL-Methionine	0.15	0.15
L-Lysine HCl	0.15	0.15
Total	100	100
Determined[1] and calculated[2] composition (% as fed basis)		
Nutrient determined analysis.		
Dry matter	85.82	87.8
Crude protein[1]	23.92	20.15
Ether extract[1]	3.51	3.2
Crude fiber[1]	4.02	4.0
Nutrient calculated analysis		
Dry matter[2]	86.6	85.9
ME (kcal/kg)[2]	2920	2857
Crude protein[2]	24.79	20.85
Ether extract[2]	3.46	3.5
Crude fiber[2]	3.86	3.9
Calcium2	0.76	0.9
Available phosphorus[2]	0.53	0.47
Lysine[2]	1.29	1.4
Methionine[2]	0.59	0.51
Total phosphorus2	0.8	0.83

[*] *Vitamins and minerals mixture provide per kilogram of diet: Vitamin A (as all-trans-retinyl acetate); 12000 IU; Vitamin E (all rac-α-tocopheryl acetate); 10 IU; k_3 3mg; Vit.D_3, 2200 ICU; riboflavin, 10 mg; Ca pantothenate,10 mg; niacin, 20 mg; Choline chloride, 500 mg; Vitamin B_{12}, 10μg; Vitamin B_6, 1.5 mg; Thiamine (as thiamine mononitrate); 2.2 mg; Folic acid, 1 mg; D-biotin, 50μg. Trace mineral (milligrams per kilogram of diet) Mn, 55; Zn, 50; Fe, 30;Cu, 10; Se, 0.1 and Ethoxyquin 3mg.*

Table (2): Efficacy of overdosing of vitamin D3 supplementation on body weight of Japanese quail at different periods of ages (g).

Treatments	Age							
	One day old	First week	Second week	Third week	Fourth week	Fifth week	Six week	Seventh week
0	8.93±0.07	19.51±1.42	43.44±0.40	72.48±0.94	125.02±1.45	142.82±6.39	174.09±4.01	209.44 [ab] ±9.96
1	8.40±0.12	21.22±1.09	43.78±0.91	72.48±7.09	128.36±5.25	147.62±5.79	178.45±11.26	220.36 [a] ±11.21
2	8.73±0.07	20.87±1.06	45.33±3.28	70.00±4.16	114.33±8.19	141.87±8.44	174.11±5.50	189.38 [b] ±2.83
3	8.67±0.33	19.80±0.47	43.33±1.68	76.36±2.03	129.69±4.35	150.43±3.27	177.27±6.37	218.55 [a] ±9.72
4	8.67±0.24	20.44±0.69	45.44±1.83	69.78±0.70	120.32±5.66	138±3.39	176.28±2.63	225.94 [a] ±2.70

a,b, means in the same column with different superscripts are significantly different. T0= control diet, T1=(1500 of vitamin D3),T2=(3000 of vitamin D3), T3=(4500 of vitamin D3),T4=(6000 of vitamin D3).

Table (3): Efficacy of overdosing of vitamin D3 supplementation on body weight gain of Japanese quail at different periods of age (g).

Treatments	Age						
	0-7	0-14	0-21	0-28	0-35	0-42	0-49
0	10.58±1.40	34.51±0.34	63.55±0.88	116.08±10.52	133.89±6.44	165.15±4.06	200.5 ab 1±6.91
1	12.82±1.20	35.38±1	64.08±7.20	119.96±5.30	139.22±5.91	170.05±11.38	211.96 a ±11.32
2	12.13±1.01	36.60±3.24	61.27±4.10	105.60±8.18	133.14±8.42	165.38±5.47	180.6 b 5±2.80
3	11.13±0.73	34.67±1.90	67.69±1.76	121.02±4.68	141.76±3.48	168.60±6.23	209.8 a 9±9.86
4	11.78±0.47	36.78±1.60	61.12±0.49	111.65±5.48	129.33±3.28	167.61±2.84	217.2 a 7±2.93

a,b, means in the same column with different superscripts are significantly different. T0= control diet, T1=(1500 of vitamin D3),T2=(3000 of vitamin D3), T3=(4500 of vitamin D3),T4=(6000 of vitamin D3).

Table (4): Efficacy of over dosing of vitamin D3 supplementation on feed consumption of Japanese quail at different periods of ages (g).

Treatments	Age						
	0-7	0-14	0-21	0-28	0-35	0-42	0-49
0	22.20±0	80.42 ±3.61 [b]	166.27±5.27[a]	299.26±9.01	487.95±13.94	715.93±22.88	944.46±31.83
1	22.20±0	73.42 ±1.09 [b]	162.22±2.55[a]	289.23±2.55	464.35±2.48	675.42±2.67	887.45±2.78
2	22.20±0	72.31 ±2.38 [b]	163.20±3.40[a]	285.58±4.20	456.46±3.59	662.50±7.18	869.60±11.89
3	22.20±0	73.20 ±1.50 [a]	168.25±3.59[a]	297.27±5.48	476.13±9.53	692.01±14.97	909.22±20.21
4	22.20±0	74.53 ±0.58 [ab]	150.17±2.51[b]	280.92±8.84	460.95±20.37	678.62±34.45	896.92±48.67

a,b, means in the same column with different superscripts are significantly different.
T0= control diet, T1=(1500 of vitamin D3),T2=(3000 of vitamin D3), T3=(4500 of vitamin D3),T4=(6000 of vitamin D3).

Table (5): Efficacy of overdosing of vitamin D3 supplementation on feed conversion ratio of Japanese quail at different periods of ages (g, feed/g, gain).

Treatments	Age						
	0-7	0-14	0-21	0-28	0-35	0-42	0-49
0	2.17±0.28	2.33±0.11	2.62±0.12	2.61±0.16	3.65±0.09	4.33±0.06	4.73 [a] ±0.29
1	1.76±0.15	2.08±0.04	2.59±0.28	2.42±0.10	3.35±0.14	4.01±0.27	4.20 [b] ±0.21
2	1.85±0.15	2.01±0.20	2.68±0.18	2.74±0.22	3.45±0.19	4.01±0.10	4.81[a] ±0.05
3	2.01±0.13	2.13±0.17	2.49±0.03	2.47±0.13	3.36±0.10	4.12±0.21	4.36 [b] ±0.31
4	1.89±0.08	2.04±0.10	2.46±0.06	2.52±0.07	3.56±0.06	4.06±0.27	4.13 [c] ±0.27

a,b,c means in the same column with different superscripts are significantly different.
T0= control diet, T1=(1500 of vitamin D3),T2=(3000 of vitamin D3), T3=(4500 of vitamin D3),T4=(6000 of vitamin D3).

Table (6): Effect of treatments on European Production Efficiency Factor and European Broiler Index of Japanese quail.

Treatments	Bw0	BW-49day(g)	BW-49day(kg)	T WG	A D G	F C R	Viability, %	EPEF	EBI
0	8.93	209.44	0.209	200.51	4.09204	4.73	100	442.79	865.12
1	8.40	220.36	0.220	211.96	4.32571	4.2	100	524.67	1029.93
2	8.73	189.38	0.189	180.65	3.68673	4.81	100	393.72	766.47
3	8.67	218.55	0.219	209.88	4.28327	4.36	100	501.26	982.40
4	8.67	225.94	0.226	217.27	4.43408	4.13	100	547.07	1073.63

EPEF = Europe Production efficiency Factor.
EBI= Europe Broiler Index.
Bw0=Body weight at one day old. TWG (Total weight gain, g). ADG=average day gain during 49 days of age.
Viability=100-%mortality. T0= control diet, T1=(1500 of vitamin D3),T2=(3000 of vitamin D3), T3=(4500 of vitamin D3),T4=(6000 of vitamin D3).

Table (7): Efficacy of overdosing of vitamin D3 supplementation on carcass traits of Japanese quail.

Treatments	Traits							
	Live BW	Dressed %	Blood %	Blood (g)	Breast(g)	Breast %	Thigh (g)	Thigh %
0	$743.3^a \pm 18.8$	73.2 ± 2.5	3.6 ± 0.15	8.9 ± 0.5^a	96.6 ± 2.4^a	39 ± 2.9	59.5 ± 1.5^a	24 ± 1.5
1	$726.7^{ab} \pm 32.2$	74 ± 1.3	3 ± 0.51	6.7 ± 0.96	94.5 ± 4.1^{ab}	39 ± 2.9	58.1 ± 2.6^{ab}	24 ± 2.0
2	$631.7^b \pm 50.4$	74.4 ± 0.74	3.9 ± 0.55	8.3 ± 1.6	82.1 ± 6.6^b	39 ± 2.9	50.5 ± 4^b	24 ± 1.5
3	$648.3^{ab} \pm 13$	74.2 ± 2.1	3.1 ± 0.49	6.7 ± 0.96	84.3 ± 1.7^{ab}	39 ± 4.1	51.9 ± 1^{ab}	24 ± 2.1
4	$686.7^{ab} \pm 30.3$	71.5 ± 1.1	2.9 ± 0.13	6.7 ± 1.1	89.3 ± 3.9^{ab}	39 ± 2.9	54.9 ± 2.4^{ab}	24 ± 1.5

a,b, means in the same column with different superscripts are significantly different.
T0= control diet, T1= (1500 of vitamin D3),T2=(3000 of vitamin D3), T3=(4500 of vitamin D3),T4=(6000 of vitamin D3).

Table (7): Cont.

Treatments	Traits			
	Heart (g)	Heart %	Liver (g)	Liver%
T0	2.6 a ±0.06	1±0	7.4±0.19a	3±1.8
T1	2. 4 ab ±0.11	1±0	7.3±0.32ab	3±2.6
T2	2.1 b ±0.17	1±0	6.3±0.50b	3±1.8
T3	2.2 ab ±0.04	1±0	6.5±0.13ab	3±2.6
T4	2.3 ab ±0.10	1±4.5	6.9±0.30ab	3±1.8

a,b, means in the same column with different superscripts are significantly different.
T0= control diet, T1= (1500 of vitamin D3),T2=(3000 of vitamin D3), T3=(4500 of vitamin D3),T4=(6000 of vitamin D3).

Table (8): Efficacy of overdosing of vitamin D3 supplementation on blood parametersofJapanese quail.

Treatments	GPT	T. protein	Cholesterol	Glucose	Calcium	Phosphorous
T0	16.7±0.65	2.8 ±0.55	209.1±39.6	333.1±1.4	11.2±1.2	5.9±0.10
T1	15.4±2.4	2.4±0.45	172.1±39.4	343.7±44.3	10±1.8	6.2±0.24
T2	16.3±1.5	4.9±0.50	126.4±4.49	352.3±18	9.3±1.4	6.1±0.03
T3	16.3±0.92	3.9±1.5	199.6±14.2	340.8±75.4	11.3±1.3	6.2±0
T4	17.4±1.6	3.1±0.32	160.5±19.5	402.6±15.4	11.1±0.37	5.6±0.68

a,b, means in the same column with different superscripts are significantly different. T0= control diet, T1=(1500 of vitamin D3),T2=(3000 of vitamin D3), T3=(4500 of vitamin D3),T4=(6000 of vitamin D3).

تأثير إضافة الجرعات العالية من فيتامين د3 علي معدل اداء النمو وبعض مكونات الدم في السمان الياباني

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صممت التجربة لدراسة فاعلية الجرعات العالية من فيتامين د 3 على معدل اداءالنمو ، ومقاييس الذبيحة وبعض مكونات الدم في السمان الياباني فى تجربة احصائية احادية العامل One way analysis of variance لتحليل التباين واستمرت التجربة لمدة 49 يومًا. تم استخدام 225 كتكوت سمان يابانى عمر يوم. وزعت الكتاكيت عشوائيا على 5 معاملات لكل منها 3 مكررات كل منها 15 طائرا. تم استخدام خمسة مستويات من فيتامين د 3 (0 ، 1500 ، 3000 ، 4500 و 6000 وحدة دولية / كجم عليقة) علما بان العليقة الاساسية تحتوى على 2200 وحدة دولية من فيتامين د3/كجم عليقة. تم تسجيل وزن الجسم وكمية العلف المستهلكة أسبوعياً وبالتالي تم حساب زيادة وزن الجسم وكذلك افضل معدل تحويل غذائي.في نهاية التجربة تم ذبح ثلاثة طيور من كل مجموعة لتقييم أجزاء الذبيحة. وتم الحصول على عينات سيرم الدم من الكتاكيت عند عمر 49 يوم بعد الطرد المركزي وذلك لقياس البروتين الكلي والكوليسترول والجلوكوز والكالسيوم والفوسفور و ال GPT. وأظهرت النتائج عند عمر 49 يوم ، ان طيور السمان التى تغذت على أعلى مستوى من فيتامين D3 (6000 وحدة دولية / كجم علف) حققت معنوياً ($P < 0.05$) أعلى وزن للجسم وكذلك اعلى زيادة فى وزن الجسم وكذلك نسبة التحويل الغذائي. كما لم يلاحظ أي آثار معنوية ($P > 0.05$) بسبب اضافة فيتامين D3 على % للذبيحةوبعض مكونات الدم التي تم قياسها. وتوصى الدراسة بأن يتم استخدام الجرعة الزائدة من فيتامين د 3 بمعدل (6000 وحدة دولية / كجم عليقة) وذلك لما حققته من معدل أداء عالى تحت ظروف التجربة.