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The Effects of Dietary Date Pit on the Productive and Economic Efficiency of Japanese Quail

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Abstract

A total of 153 unsexed day-old-quail chicks, were randomly allocated into three experimental groups (51 quail/each group). Each group consists of 3 replicates (17 quail/each replicate); three isonitrogenous and iso-energetic diets were formulated. Date pits were collected, dried and crushed as meal, then chemically analyzed. Three diets (Control, D1 and D2) were prepared. Two diets (D1and D2) were formulated to contain 2.5 and 5% crushed date pit (CDP); respectively. All the diets were fortified with a constant level of salt and vitamin-mineral premix and were supplemented with exogenous enzymes. Diets and water were offered ad-libitum to quail and feed intake was recorded daily. Body weight change was recorded weekly. Blood samples were collected at 2nd, 4th and 6th week from starting of the experiment for hematological and biochemical parameters estimation. At the end of the experiment (42 d of age) quail were slaughtered for carcass traits measurements. Liver samples were collected for estimation of hepatic expression of Growth Hormone Receptor (GHR) and Insulin Growth Factor-1 (IGF-1) genes in different experimental groups. Results revealed that quail diet supplemented with 2.5% and 5% CDP improved body weight, body weight gain, relative growth rate percentage and feed conversion rate of quail. Results of carcass traits showed that D2 (5% CDP) group had the highest significant value for dressing percentage. Results of blood showed no adverse effect of CDP inclusion in the diet of quail. The results of gene expression indicated non-significant changes in eth hepatic expression of GHR and IGF-1 in different experimental groups. From the economic point of view, our results showed that the cost of one ton of feed is reduced for D1 and D2 containing CDP. Inclusion of 5% and 2.5% CDP in quail diet were more profitable when compared with control diet. In conclusion, CDP can be satisfactory added to quail diets without negative effect on growth, health or carcass characteristics. It also reduces production costs, improves profitability, and saves the environment by preventing pollution caused by processing wastes.

Key words:
Date pits, Quail, Growth rate, Carcass traits, Hematological parameters, Gene expression, Economic efficiency.

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1. INTRODUCTION

Poultry industry in Middle Eastern countries has tremendously increased due to their importance and demand, basically this industry relies on costly imported feed. Giving the fact that the Middle Eastern countries are the largest producer of dates in the globe; whereas over 70% of the total world production of dates is produced in this area, thus utilization of date pits could provide a potential alternative to the conventional feeds used in the poultry industry (Al–Attar and Sial, 1978; Al–Bowait and Al–Sultan, 2007). There are 11.829.410 female date palms in Egypt and total production of date fruits amounts to 1.300.000 tons/year (Omar, 2011).The growing demand of dates enhanced their production which reached 7.2 million tons in 2010 (FAO, 2011), and approximately 720,000 tons of date–pits could be produced annually (i.e. considering 10% of the total fruit mass) (Mohammad et al., 2014). Date pits are generally used as complementary feed materials for animals and poultry (Vandepopuliere et al., 1995). The date pit represents about 10% of whole date weight (Hassan and Al Aqil, 2015). It contains about 2.30-8.20 % crude protein, 13.0-80.20 % crude fiber, 0.90-3.95 % crude ash (Al-Saffar et al., 2013; Attalla and Harraz, 1996; Ghasemi et al., 2014; Hamada et al., 2002; Najib and Al-Yousef, 2012).Commercialization of quail production is recent (Akpan and Nsa, 2009). Raising Japanese quail for food can be regarded as another dimension of poultry farming as a result of increase demand for animal protein in developing countries, and they are more tolerant to poor conditions of management than the chicken and resistant to common poultry diseases (Owen and Dike, 2013). Limited researches have been conducted on the utilization of date pits for quail diets. Therefore, this study was carried out to investigate the response of Japanese quail to diets containing two levels (2.5 and 5%) of dried crushed date pits. The evaluated parameters are growth performance, some blood constituents, carcass characteristics, and economic efficiency.

2. MATERIALS AND METHODS

2.1. Management of quail:

2.1.a. Housing:

The experiment was carried out at Quail Research Center of the Faculty of Veterinary Medicine, Benha University, Egypt. The experimental period was 42 days, from the period extended from the 4th of October 2015 to 15th November 2015. A total of 153 unsexed day-old-quail chicks, were randomly allocated into three experimental groups (51 quail/each group). Each group consists of 3 replicates (17 quail/each replicate); on the 14th day chicks were wing-banded for their identification. Body weight was recorded individually, and the chicks were housed in well ventilated litter floor house. The stocking density was 10 birds /m^2. All quails were medicated similarly and regularly and they were subjected to the same managerial, hygienic and climatic conditions. Brooding temperature started at 35ºC during the first 3 days, then 32ºC to the end of the 1st week; 30ºC for the 2nd week; 29ºC throughout the 3rd week till the end of experiment. Natural and artificial lighting was provided for 24 hours over the experimental period.

2.1.b. Diet and experimental design:

Date pits were dried in an oven at 65ºC for 72 hrs. Then crushed in a disc crusher and then grind them with a hammer-mill (Abdelghani et al., 2004; Al-Banna et al., 2010; Al-Suwaiegh, 2015). Sample of crushed date pits (CDP) was chemically analyzed for composition according to (A.O.A.C., 2004) in order to formulate iso-nitrogenous and iso-energetic balanced diets. Three diets (Table 1) were formulated according to the nutrient requirements (N.R.C., 1994), Two diets (D1and D2) were formulated to contain 2.5 and 5% CDP; respectively. All the diets were fortified with a constant level of salt and vitamin-mineral premix and were supplemented with exogenous enzymes, as date pits contained about 71.8% mannose, 26.6% galactose and 9.8-22.3% beta-galactomannan polysaccharides (Hamada et al., 2002; Hassan and Al Aqil, 2015). The crude fiber (non-starch betagalactomannan polysaccharides) is recognized as antinutritional factor difficult to digests by poultry and required to be broken down by specific exogenous enzymes to improve the utilization and the nutritional value of the date pits meal (Almirall et al., 1995; Cowieson and Ravindran, 2008). Quail chicks were fed on basal diet during the first two weeks of age, and then they were randomly allocated into three experimental groups and were fed ad libitum on the 3 different experimental diets until the end of the experiment (42 d of age) as the following:

1-Group 1 received (Control) basal diet.
2-Group 2 received (D1) diet containing 2.5% CDP.
3-Goup 3 received (D2) diet containing 5% CDP.

Chemical composition of the diets illustrated in table (2).

2.3. Studied traits:

2.3. a. Productive efficiency measurements:

2.3. a. 1. Growth traits:

Body weight:

At the beginning of the experiment (at one day old), the chicks were individually weighted to the nearest gram, and then they were weighed weekly till the end of the experiment (Mohammad et al., 2014).

Average daily gain (ADG):

It is the weight gain related to the number of days calculated. ADG=W2-W1/Days (7) according to (Basant 2013).

2.3. a. 2. Body weight:

Relative growth rate (RGR):

RGR (expressed in percentage) was calculated every week according to (Regassa et al., 2013) using the following formula:

RGR = (W2-W1)100/1/2 (W2+W1)

Where: W1= body weight at the beginning of week or period.

W2= body weight at the end of week or period.

Feed intake:

Daily feed intake was calculated by obtaining the difference between the offered feed weight and the remained part. The total feed consumption per day was divided on the number of quails of each group to obtain the average daily feed consumption per quail.

Feed Conversion Ratio (FCR) : according to (Lambert et al., 1936)

FCR=Feed intake (g/chick/week)/Body Weight Gain (g/chick/week)

2.4. Evaluation of carcass parameters:

At the end of the experiment, quail (5/group) were randomly taken and weighed, fasten for 12 hours, in the slaughter house of research center in the faculty of Veterinary Medicine, Benha University, slaughtered by cutting carotid arteries and jugular veins , and allowed to bleed for a 4 min, each quail was dipped in a water bath at 55°C for 2 min ,then defeathered and processed by removing the head, neck, shanks and feet and eviscerated by cutting around the vent and carefully removing the viscera, then the dressed carcass was weighed and the dressing percentage was obtained by expressing the dressed carcass weight as a percentage of live body weight according to (Brake et al., 1993).

Dressing %=(Dressed carcass weight/Live weight)*100

Relative internal organs weight:

Heart, gizzard, liver, spleen weights were recorded individually and their percentages in relation to live body weight were calculated as (Atia et al., 2000).

2.5. Blood Sampling

About 1~2 ml of blood from the birds were aseptically collected from the jugular vein/wing vein with a sterile 2 ml disposable syringe. Blood samples were collected at 2nd, 4th and 6th week from starting of the experiment. About 0.5-1 ml of blood was taken in a vial containing EDTA as anticoagulant at 1mg/ml, for estimation of hematological parameters and the remaining 0.5-1 ml of blood was kept in a dry wide-mouthed test tube in slanting position at room temperature for separation of serum. The serum was separated after 6-8 h following collection and stored at −20°C for biochemical analysis. The liver specimens were quickly removed and kept for gene expression at -80ºC.

Table (1): Ingredient and chemical composition of experimental diets .

Feed ingredients (% as fed)	**Control**	**D1**	**D2**
Yellow Corn	55.10	52.29	49.23
Soyabean (44%) protein	35.0	35.0	35.0
Corn gluten meal	5.20	5.30	5.35
Date pit meal	-	2.50	5.00
Di-calcium phosphate	1.45	1.45	1.45
Limestone	1.45	1.40	1.35
Vegetable oil	0.50	0.80	1.35
Sodium chloride	0.30	0.30	0.30
Vit &min premix[1]	0.30	0. 30	0.30
Sodium bicarbonate	0.170	0.170	0.165
L-Lysine	0.150	0.160	0.165
D-L methionine	0.120	0.120	0.125
Anticolesterdia	0.10	0.50	0.05
Anticoccedia	0.05	0.05	0.05
Antimycotoxin	0.05	0.05	0.05
Energy enzyme[2]	0.05	0.05	0.05
Phytase enzyme[3]	0.01	0.01	0.01
Total	100.0	100.0	100.0

(1) Purchased by AGRI-VIT 10th of Ramadan city, Egypt. Each 3 kg contains**:**Vitamin A 12000000 IU. Vitamin D3 2000000IU, vitamin E 10000 IU, vitamin K3 2000 mg, vitamin B1 1000 mg, vitamin B2 5000 mg, vitamin B6 1500 mg, vitamin B12 10 mg, niacin 30000 mg, Bioten 50 mg, folic acid 1000 mg, pantothenic acid 1000 mg, Nicotinic acid 30000mg and mineral mixture are manganese 6000 mg, zinc 50000 mg, iron 30000 mg, copper 1000 mg, iodine 300 mg, selenium 100 mg, cobalt 100 mg, carrier (Caco3) add to 3kg. (2)Energy enzyme: Hemicell, (3) Phytase enzyme: Avemix P5000.

2.5.a. Hematological parameters measurement:

Hematological variables including white blood cells (WBCs) and red blood cells (RBCs) were performed in a Neubauer hemocytometer using a 1:200 dilution with Natt and Herrick solution. Differential leukocyte count, hemoglobin (Hgb) concentration, packed cell volume (PCV) were determined as described previously (Campbell, 1995).

2.6. Biochemical parameters assay:

Serum were separated and immediately used for the analysis of aspartate aminotransferase (AST), alanine aminotransferase (ALT), total protein, albumin, total cholesterol, triglycerides, creatinine and urea using commercial kits (Spinreact, Barcelona, Spain) on an Ultraviolet-visible spectrophotometer.

2.7. Analysis of mRNA expression of hepatic growth hormone receptor (GHR) and insulin growth factor-1 (IGF-1) genes:

This step was carried out at Central Laboratory, Faculty of Veterinary Medicine, Benha University, Egypt. Liver samples were dissected from all quail groups (Control, D1and D2, and then frozen at -80°C immediately.

Total RNA was extracted from the frozen liver using RNeasy® Mini kit (Qiagen) following the manufacturer's protocol. RNA quantity and quality were determined by using spectrostarNano drop. Single stranded cDNA was synthesized from 1000 ng of total RNA according to manufacturer’s protocol of High Capacity cDNA Reverse Transcription Kits (Applied Bio systems). Cycling conditions were: 25°C for 10 min, 37°C for 120 min and 85° C for 5 min. Then total RNA and cDNA samples were stored at -80° C until use.

To better understand the effect of date pit inclusion on growth rate, expression of hepatic Growth Hormone Receptor (GHR) and Insulin Growth Factor-1 (IGF-1) genes was analyzed by real time-PCR using sense and anti-sense primers as previously described (Gasparino et al., 2014) using the following primers sets: GHR, sense (5′-AACACAGATACCCAACAGCC-3′) and anti-sense (5′- AGAAGTCAGTGTTTGTCAGGG-3′); IGF-1, sense (5′- CACCTAAATCTGCACGCT-3′) and anti-sense (5′- CTTGTGGATGGCATGATCT-3′); and β-actin as a housekeeping gene, sense (5′-ACCCCAAAGCCAACAGA-3′) and anti-sense (5′-CCAGAGTCCATCACAATACC-3′).

PCR reactions for each gene were carried out for each analyzed sample. Each PCR reaction consisted of 1.5 µl of 1µg/µl cDNA, 10 µl SYBR Green PCR Master Mix (QuantiTect SYBR Green PCR Kit, Qiagen), 1 µM of each forward and reverse primer for GHR and IGF-1 genes while 1 µM of forward and 1.5 µM reverse primer for B-actin gene and nuclease free water to a final volume of 20 µl. Reactions were then analyzed on an Applied Biosystem 7500 Fast Real time PCR Detection system under the following conditions: 95°C for 10 minutes (holding stage) and 40 cycles of 95°C for 15 seconds (denaturation stage) followed by 60°C for 1 minute (annealing and extension stage).

Changes in gene expression were calculated from the obtained cycle threshold (C_t) values provided by real-time PCR instrumentation using the comparative CT method to a reference (housekeeping) gene (β-actin) (Gasparino et al., 2014).

2.8. Economic efficiency studied parameters:
Costs of production:

The costs of production are classified into total fixed costs, total variable costs and total costs.

Total variable costs (TVC): It included feed costs including CDP cost for each diet. It was calculated for each quail per Egyptian pound during the period of the experiment according to (Atallah, 1997).

Total fixed costs (TFC): These costs included labor, litter, total veterinary management (drugs and veterinary supervision), water and electricity, building rent value and equipment depreciation, these parameters considered as a fixed costs for all the experimental groups (Shreya et al., 2014). The equipment depreciation was calculated as the value of equipment (L.E) for project cycles per number of years divided by the total number of quail (Sankhyan, 1983; Sarkar et al., 2008).

Total costs (TC): were estimated by summation of TFC and TVC values according to (Mohamed, 2015).

Returns parameters:

Total returns (TR): according to (El-Sheikh et al., 2013)

-Total returns = Litter sale + quail sale.

-Litter sale = Litter sale price / No. of quail at end of the experiment.

-Quail sale = Body weight with grams at the end of experiment (6^{th} week) x Gram price.

Net Profit (NP): It was calculated according to (Mohammad et al., 2014; Omar, 2003) using the following equation:

Net profit = Total returns – Total costs.

Economic efficiency measurements: were calculated according to (Atallah, 2004).They included percentages of Total Return to Total Costs (TR/TC), Net Profit to Total Cost (NP/TC) and Net Profit to Total Return (NP/TR).

2.9. Statistical analysis:

Differences between studied groups were analyzed by the Statistical Analysis System (SAS, 2003) Computer Program, using the General Linear Model (GLM) procedure and Duncan's Multiple Range-Test (Duncan, 1955). Statistical significance between mean values was set at (P< 0.05). Data are reported as means and standard error. Figures were performed by using Microsoft Office Excel, (2007).

3. RESULTS AND DISCUSSION

3.1. CDP proximate analysis:

Analysis and composition of CDP are not available in the feed composition tables of quail nutrition. CDP analysis (Table 3) were in concurrence with and close to the range of the findings of (Al-Saffar et al., 2013; Attalla and Harraz, 1996; Ghasemi et al., 2014; Hamada et al., 2002; Kamel et al., 1981; Najib and Al-Yousef, 2012), they revealed that CDP contains about 89.70 to 97.5% dry matter (DM), 2.30 to 8.20 % crude protein (CP), 1.60 to13.50% Ether extract (EE), 10.0 to 20.0 % crude fiber (CF), 0.021 to 0.91% Calcium, 0.088 to 0.096% total phosphorus , 5 to 10% Moisture, 0.90 to 3.95% Ash, and the content of nitrogen free extract (NFE) was ranged from 29.56 to 75.4% . Metabolizable Energy (ME) was higher than the range of results of the same authors (from 1.350 to 2.000 kcal /kg). The variations in composition of CDP between literatures may be attributed to variation in processing methods. In this respect, (Mohammad et al., 2014) found that the values of proximate analysis of date stones were affected by the processing methods.

3.2. Growth performance and feed efficiency:

The effects of the experimental diets on BW, BWG , feed intake, RGR% and FCR values of quail during the experimental period (42 days of age) are shown in table (4 and 5). The results showed that there were no significant differences in quail's feed intake, body weight, average daily gain, RGR% and FCR among different experimental groups.

Total feed intake was higher for control group (945.02 g/quail), this increasing in feed intake for was not reflected on growth parameters. Diet containing 5% CDP, showed the lowest feed intake (880.86g/quail) with high growth performance. Concerning body weights at different ages studied, D2 group was the highest BW value at hatching, 1^{st} week, 2^{nd} week, 3^{rd} week 5^{th} week and 6^{th} week of age (5.90, 27.95, 58.41 , 94.63, 169.29 and 195.30 g; respectively). Regarding ADG, D2 group had the highest value of ADG from hatching to the 6^{th} week of age (4.50 g). For RGR%, D1 group had the highest value from hatching to the 6^{th} week intervals (189.23 %). The FCR values showed that, D1 and D2 groups showed better FCR than the control group. These results indicated that quail diet supplemented with 2.5% and 5% CDP improved BW, BWG, RGR% and FCR of quail. This may be attributed to supplementation of date pits with the exogenous enzymes which improve the utilization and the nutritional value of the date pits, by the degradation of beta-galactomannan polysaccharide (Cho and Kim, 2013; Hassan and Al Aqil, 2015). Also these results may be attributed to the presence of hormonal like compounds in date pit which acts as a growth promoter and result in increasing weight and performance of quails (Attiat, 1995).

Similar results were obtained by (Vandepopuliere et al., 1995) who found that 27 % date pits group was the highest significant value for 3^{rd} week body weight for broiler than 9 % and 18 % date pits groups (687 g). Also, it agreed with the result of (Al-Mafragy, 1999) who recorded that adding dates extract to broiler ration produced a significant increase in weight gain. Also, (Hussein et al., 1998) reported that a good performance of broiler when they were fed with diets supplemented with whole dates or date pulp. Contradicted results were obtained by (Kamel et al., 1981) who reported that the replacement of maize by whole dates resulted in decreased growth performance.

3.3. Carcass traits:

Results of carcass traits (Table 5) showed that, D2 group had the highest significant value for dressing percentage (70.78 %). There were no significant differences (P<0.05) between the experimental groups in most measured percentages of organs , except only gizzard showed Significant increase in the relative weight for D1 and D2 group, could be as a result of the hard tissue of date pits which strengthens the luminal muscles. These results agreed with the findings of researchers (Fahimeh Daneshyar et al., 2014) who indicated that no adverse effect of using CDP in the diet of broiler on carcass traits.

On the basis of these results, it was found that diet supplemented with 5 % CDP group could be utilized advantageously to improve growth and carcass traits.

Table (2): Calculated Chemical composition of experimental diets

Calculated chemical composition(%)[2]	Control	D1	D2
Dry matter	89.22	89.55	89.91
Crude protein	24.0	24.0	24.01
Metabolizable Energy (Kcal/Kg)	3000.0	3000.0	3000.53
Linoliec acid	1.50	1.58	1.74
Lipid	3.20	3.54	4.20
Crude fiber	2.29	2.52	2.74
Lysine	1.30	1.30	1.30
Methionine	0.50	0.50	0.50
Methionine+ cysteine	0.91	0.90	0.90
Calcium	1.02	1.0	1.0
Total phosphorus	0.61	0.62	0.63
Chloride	0.22	0.22	0.22
Na	0.17	0.17	0.17
Potassium	0.88	0.87	0.86
Phytate	0.26	0.26	0.25
Zn(ppm)	82.33	81.86	81.33

Requirements according to NRC for poultry (1994).

Table (3): Chemical composition of (as fed basis) of CDP.

	CDP
Dry matter (DM)	89.3
Crude protein (CP)	6.73
Ether extract (EE)	5.8
Crude fiber (CF)	11.4
Calcium	0.31
Total Phosphorus	0.62
Moisture	9.79
Ash	3.2
Nitrogen-free extract (NFE)	69.0
ME* (Kcal/Kg)	2240

* Metabolizable Energy. All percentages in the table are taken from dry matter.

Table (4): Effect of using CDP as feed ingredient in quail diets on body weight development (g/quail/week).

Parameter	Body Weight					
Groups	**1st W**	**2nd W**	**3rd W**	**4th W**	**5th W**	**6th W**
Control	26.44^a ±0.70	56.05^a ±1.70	91.13^a ±2.19	135.0^a ±2.78	162.50^b ±3.08	191.62^a ±3.19
D1	25.92^a ±0.66	56.67^a ±1.63	91.13^a ±2.19	134.17^a ±2.22	161.45^b ±2.11	190.83^a ±1.30
D2	27.95^a ±0.73	58.41^a ±1.43	94.63^a ±1.88	134.63^a ±1.50	161.45^b ±2.11	195.30^a ±1.52

The mean values with different superscript letter within the same column differed significantly at ($P < 0.05$)

Table (5): Effect of using CDP as feed ingredient in quail diets on growth performance, feed efficiency and carcass traits.

Items	Control	D1	D2
Total feed intake(g/quail)	945.02^{a}±4.40	878.9^{a}±4.24	880.68^{a}±4.43
Initial BW (g)	5.70^{ab} ±0.25	5.20^{b}±0.14	5.90^{a} ±0.27
Final BW(g)	191.62^{a} ±3.19	190.83^{a} ±1.30	195.30^{a} ±1.52
ADG(g)	4.43^{a} ±0.08	4.42^{a} ±0.03	4.50^{a} ±0.04
(RGR %)	188.60^{ab}±0.58	189.23^{a} ±0.39	187.40^{b}±0.76
FCR	5.13^{a} ±0.11	4.75^{b}±0.05	4.94^{ab}±0.08
Dressing %	65.92^{b} ±1.73	68.97^{ab} ±1.01	70.78^{a} ±0.86
Liver(g)	4.60^{a} ±0.40	5.40^{a} ±0.75	3.80^{a} ±0.49
Gizzard(g)	4.20^{b} ±0.49	8.00^{a} ±1.22	8.00^{a} ±1.22
Heart (g)	2.20^{a} ±0.20	2.40^{a} ±0.24	2.80^{a} ±0.20
Spleen (g)	3.60^{a} ±0.60	4.20^{a} ±0.49	3.40^{a} ±0.40

The mean values with different superscript letter within the same row differed significantly at (P < 0.05)

Table (6): Effect of using CDP as feed ingredient in quail diets on hematological parameters.

Period	Group	RBCs (10^6/µL)	Hb (gm/dL)	PCV (%)
2nd week	**Control**	2.3^{a}±0.12	11.03^{a}±0.18	32.0^{a}±0.57
	D1	2.2^{a}±0.10	11.06^{a}±0.11	33.33^{a}±0.88
	D2	2.5^{a}±0.20	11.1^{a}±0.51	31.33^{a}±0.88
4th week	**Control**	2.43^{a}±0.24	10.96^{a}±0.18	33.0^{a}±0.57
	D1	2.40^{a}±0.25	11.53^{a}±0.14	33.33^{a}±0.88
	D2	2.23^{a}±0.08	10.96^{a}±0.34	32.0±^{a}0.57
6th week	**Control**	2.32^{a}±0.06	9.2^{a}±0.07	28.83^{a}±0.40
	D1	2.35^{a}±0.08	9.31^{a}±0.14	28.83^{a}±0.60
	D2	2.48^{a}±0.09	9.46^{a}±0.15	29.5^{a}±0.76

The mean values with different superscript letter within the same column differed significantly at (P < 0.05)

Table (7): Effect of using CDP as feed ingredient in quail diets on hematological parameters .

Period	Group	Neutrophil (10^3/µL)	Lymphocyte (10^3/µL)	Monocyte (10^3/µL)	Eosinophil (10^3/µL)	Basophil (10^3/µL)	WBCs (10^3/µL)
2nd week	**Control**	0.30^{b}±0.06	1.51±0.14	0.08^{b}±0.008	0.05±0.009	0	1.96±0.12
	D1	0.45^{b}±0.08	1.60±0.09	0.12^{b}±0.008	0.08±0.02	0	2.26±0.18
	D2	1.85^{a}±0.08	3.49±2.17	0.88^{a}±0.04	0.09±0.09	0	2.36±0.26
4th week	**Control**	0.43±0.26	1.85±0.44	0.10±0.05	0.07±0.05	0	2.46±0.29
	D1	0.32±0.09	2.00±1.30	0.14±0.08	0.09±0.13	0	2.56±0.28
	D2	0.30±0.01	1.97±0.03	0.28±0.03	0.1±0.007	0.01±0.001	2.4±0.20
6th week	**Control**	0.27±0.15	1.40^{ab}±0.51	0.09±0.06	0.05±0.06	0.01±0.03	1.85^{b}±0.09
	D1	0.36±0.30	1.59^{a}±0.35	0.1±0.06	0.07±0.11	0	2.13^{a}±0.08
	D2	0.29±0.19	1.21^{b}±0.30	0.07±0.04	0.04±0.05	0.01±0.03	1.65^{b}±0.07

The mean values with different superscript letter within the same column differed significantly at (P < 0.05)

3.5. Hematological and biochemical parameters:

Feeding different concentrations of date pits showed non-significant changes in the erythrogram, meanwhile it caused significant increase in the absolute numbers of neutrophils and monocytes in groups received 5% concentration when compared with the control after 2nd week of the experiment indicating improving innate immune response of quails (Carrillo-Vico et al., 2013). In regard to biochemical parameters, there were non-significant changes in liver functions markers (ALT and AST) and kidney functions markers (Urea and creatinine) as well as metabolic markers (total protein, albumin, total cholesterol and triglycerides) indicating absence of any adverse effects of feeding date pits on hepatic and renal functions (Table 6,7and 8).

3.6. Genetic evaluation:

The results of gene expression (Figure, 1) indicated non-significant changes in eth hepatic expression of GHR and IGF-1 in different experimental groups. These results confirm that no correlation between plasma IGF-I levels and plausibly its gene expression with body weight gain in this genetic model of avian implying the importance of other factors besides GH in regulation of IGF-I in chicken (Rahimi, 2005). On the basis of this study it can be suggested that endocrine parameters may offer alternative approaches of genetic variability with the aim to stabiles underlying causal mechanisms.

Table (8): Effect of using CDP as feed ingredient in quail diets on Biochemical parameters for the sixth week of age.

Item	Control	D1	D2
AST(U/L)	$159.76^{a}\pm30.88$	$144.86^{a}\pm16.59$	$176.65^{a}\pm17.92$
ALT(U/L)	$18.06^{a}\pm3.61$	$15.56^{a}\pm1.40$	$17.02^{a}\pm1.3$
Urea (mg/dL)	$108.73^{a}\pm8.65$	$102.37^{a}\pm24.4$	$91.92^{a}\pm16.95$
Creatinine (mg/dL)	$0.25^{a}\pm0.04$	$0.27^{a}\pm0.08$	$0.25^{a}\pm0.06$
Total Protein (g/dL)	$32.56^{a}\pm2.22$	$34.02^{a}\pm3.74$	$30.0^{a}\pm2.79$
Albumin (g/dL)	$17.03^{a}\pm2.58$	$16.03^{a}\pm2.04$	$17.03^{a}\pm2.06$
Total cholesterol (mmol/L)	$163.16^{a}\pm29.22$	$181.43^{a}\pm9.45$	$168.73^{a}\pm16.14$
Triglycerides(mmol/L)	$74.93^{a}\pm7.59$	$67.93^{a}\pm6.60$	$82.26^{a}\pm4.01$

The mean values with different superscript letter within the same column differed significantly at ($P < 0.05$)

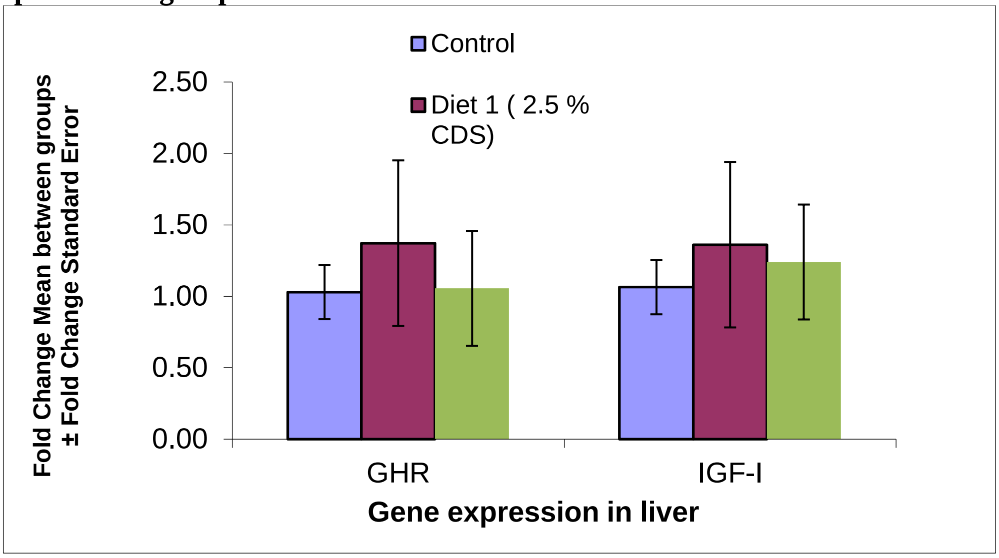
Table (9): Effect of using CDP as feed ingredient in quail diets on economic efficiency parameters .

Items (L.E/quail)	Control	D1	D2
Equipment depreciation	0.02	0.02	0.02
Building rent value	0.9	0.9	0.9
Water& Electricity	0.13	0.13	0.13
Labor	0.40	0.40	0.40
Veterinary management	0.16	0.16	0.16
Litter cost	0.16	0.16	0.16
Purchased quail	1.0	1.0	1.0
TFC	2.77	2.77	2.77
Cost of one ton of diet	3428.52	3372.34	3352.32
Total feed cost	$3.24^{a}\pm0.05$	$2.96^{a}\pm0.02$	$2.95^{a}\pm0.03$
TC	$6.01^{a}\pm0.05$	$5.73^{a}\pm0.02$	$5.72^{a}\pm0.03$
Quail sales	$7.665^{a}\pm0.13$	$7.633^{a}\pm0.05$	$7.812^{a}\pm0.06$
Litter sales (L.E/ quail)	0.2	0.2	0.2
TR (L.E/ quail)	$7.865^{a}\pm0.13$	$7.833^{a}\pm0.05$	$8.012^{a}\pm0.06$
NP (L.E/ quail)	$1.85^{c}\pm0.13$	$2.10^{b}\pm0.05$	$2.29^{a}\pm0.07$
TR/TC	$131.08^{c}\pm2.30$	$136.72^{b}\pm0.99$	$140.23^{a}\pm1.40$
NP/TC	$31.08^{c}\pm2.30$	$36.72^{b}\pm0.99$	$40.23^{a}\pm1.40$
NP/TR	$0.23^{a}\pm0.01$	$0.27^{a}\pm0.01$	$0.28^{a}\pm0.01$

L.E, Egyptian Pound; TFC, Total fixed costs; TC, Total costs; TVC, Total variable costs; TR, Total returns; NP, Net profit.

The mean values with different superscript letter within the same row differed significantly at ($P <$ 0.05)

Figure (1): Effects of Dietary Date Pit on liver GHR and IGF-I mRNA expression levels measured by real-time qPCR. Y-axis shows data represented as fold change among different experimental groups.



3.7. Economic efficiency:

Economically, the effects of feeding diet contained CDP for different experimental groups (Table 9) showed that the TFC of production had no significant differences (P<0.05) among all experimental groups. TFC included the price of equipment depreciation and building rent value (L.E 0.02 and 0.9 /quail, respectively), water and electricity value L.E 0.13/quail, labor value L.E 0.40/quail , veterinary management value L.E 0.16/ quail, litter value L.E 0.16/quail, and chick cost L.E 1.00. In our study, TFC was L.E 2.77 per each quail in each group because each chick in each group was the same price, and received the same labor, water and electricity. In addition, building rent value and equipment's depreciation value were fixed for all chicks. Hence, all of these parameters were considered fixed costs for each chick used in this study (Fardos, 2009; Mohamed, 2015).

Regarding total feed cost, control group showed the higher total feed cost L.E 3.24 /quail during the experimental period, and were L.E 2.96 / quail and L.E 2.95 for 2.5% and 5% CDP experimental group, respectively. Consequently, the TC was higher for the control group L.E 6.01/quail, than 2.5% and 5% CDP experimental group (L.E 5.73 and L.E 5.72/quail, respectively). These results indicate that feeding quail diet contained CDP reduces the production cost (El-Sheikh et al., 2013).

Our results showed that the cost of one ton of feed is reduced for D1 and D2 containing CDP. The feed cost/ ton of feed saved about (L.E. 56.18 and 76.2/ ton for 2.5% and 5% CDP experimental groups, respectively). Meanwhile, the control diet has the highest feed cost/ ton. These results agreed with the observations of (El-Sayed et al., 2006; Gaber et al., 2014) they indicate that the costs of one kg of diet declined by the incorporation of non-conventional energy sources supplemented, due to its low price.

Concerning TR values, obtained in the form of quail and litter sales (Table 9) , regarding quail sales ,it were L.E. 7.812 /quail for 5% CDP experimental group, followed by the control group L.E. 7.665/quail, and finally 2.5% CDP experimental group L.E. 7.633/quail. Litter sales were L.E. 0.2 /quail for the three experimental groups. Consequently TR values were L.E. 8.012/ quail for 5% CDP experimental group, followed by control group L.E. 7.865/ quail, and finally 2.5% CDP experimental group L.E. 7.833/ quail.

NP values were significantly higher ($P < 0.05$) for 5% and 2.5% CDP experimental groups (L.E 2.29, 2.10 / quail, respectively), than that for the control group which was L.E. 1.85 / quail.

The percentages of TR/TC and NP/TC showed significant differences ($p \leq 0.05$) among different groups. But there were no significant differences (*P*

> 0.05) for the percentages of Net profit to total return .The percentages of Total returns to total costs were 140.23% and 136.72% for 5% and 2.5% CDP experimental groups, respectively. However, the percentages of Net profit to total costs were 40.23% and 36.72% for 5% and 2.5% CDP experimental groups, respectively.

In conclusion, these results of this study indicate that from feed utilization data and from the economical point of view the diet contained up to 5% CDP could be recommended as suitable feed for Japanese quail, without negative effect on growth, health or carcass characteristics, reduces the costs of production with improving net profit.

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