EFFECT OF USING DRIED OLIVE CAKE ON SOME PHYSIOLOGICAL PARAMETERS OF BROILER CHICKS

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ABSTRACT

Two hundred and fifty unsexed 7-day-old Ross 308 chicks were randomly divided into four groups containing 63, 62, 62 and 63 chicks respectively, each in three replicates. Group one as control and the others as three experimental groups (3,6 and 9% dried olive cake, DOC). Chicks were fed grower diets from 7 up to 28 day and finisher diets from 29 up to 46 day of age. Chicks housed in floor pens and were offered feed and water *ad libtum*. The different levels of DOC did not have significant effect on live body weight gain (BWG), feed conversion (FC), performance index (PI), Plasma total protein %, albumin%, , glucose (mg/100 ml), AST (U/l) and ALT (U/l) , hematological parameters and carcass traits. However, the different levels of DOC caused high significant increase in feed intake (FI) of broiler chicks compared to the control group. The groups fed 3 and 6% DOC had significant decrease in globulin % ,but these groups had high significant increase in albumin/globulin ratio compared to the control and those fed the 9% DOC. However, the groups fed 6 and 9 % DOC had significant decrease in plasma total cholesterol and these groups had high significant decrease in plasma triglycerides (mg/100 ml)

Key words: Broilers , dried olive cake, performance, plasma constituents, hematological parameters and carcass traits.

Introduction

Cultivation of olives has a long-standing tradition in many countries throughout the world but it is particularly well developed in the Mediterranean region. Olive cake is a by-product obtained in the process of extraction of olive oil from olives by pressing. In the mass cultivation of olives the oil extraction process yields considerable quantities of olive cake estimated to be 30-40 % of the original quantity of olives **(Sansoucy,1985).** This by-product is used as cattle feed in some countries, whereas in other countries it is disposed of in the area around the oil- producing plant, thereby polluting the environment. The Proximate chemical analysis of dried olive cake were 6.00% CP, 8.2.0% EE, 48.2% CF, 6.60% ash and 10.70% moisture **(Hashish and Abd El-Samee, 2002)**, while, **AL-Shanti (2003)** recorded 10.72% CP, 6.43% EE, 37.23% CF, 7.9% ash and 11.36% moisture. This variation in chemical composition may be due to the types and sources of the fruits, degree of maturity and the percentage of moisture (**AL-Shanti, 2003**). Olive oil is rich in monounsaturated fatty acids and antioxidant (vitamin E, β carotene and

phenolic compounds) that could decrease susceptibility of low density lipoprotein (LDL) to oxidation. Therefore, incorporation of dried olive cake (cheap untraditional feedstuffs) in poultry diets may participate in solving the problem of feed shortage, improve the economical efficiency of poultry production and alleviate the pollution problems. Some studies investigated the effect of olive cake on laying hens up to 5.7% of diet (**Hashish and Abd El-Samee, 2002**) and found no detrimental effects on laying performance and improved relative economical efficiency .There is a little information concerning the use of olive cake in broiler diets, therefore, this experiment was carried out to study the effect of using different levels of olive cake on broiler performance, physiological parameters.

Materials and Methods

The present experiment was carried out at Poultry Farm, Poultry Department, High Institute of Agriculture Techniques, AL-Gheran Tripoli, Libya, to study effects of using dried olive cake on some physiological parameters (performance, plasma constituents, hematological parameters and carcass traits) of broiler chicks

Two hundred and fifty unsexed 7-day-old Ross 308 chicks were randomly divided into four groups containing 63, 62, 62 and 63 chicks, each in three replicates (20 or 21chicks / replicate). Group one was considered as the control and the others as three experimental groups fed either 3,6 or 9% dried olive cake (DOC). All chicks were wing banded and housed in floor pens on wood shavings with density of 10 chicks / m^2. The gas heating was used. Chicks were fed grower diets from 7 up to 28 days of age, thereafter , chicks were fed finisher diets up to 46 days. Chemical analysis of dried olive cake was assayed according to the procedures **AOAC (1990)**. Diets were formulated according to **NRC recommendation (1994)**. The composition and chemical analysis of the experimental diets are shown in Table (1). Individual live body weight (LBW) and feed consumption for each replicate were recorded biweekly during the experimental period. Body weight gain (BWG) and feed conversion, [FC= feed intake (g) /gain (g)] and performance index, PI= [(LBW, kg/ FC)*100] was calculated according to the equation described by **North (1981)**. At the end of the experimental period, six birds (3 males and 3 females) per group were chosen around mean average of treatment for slaughter test, blood samples were collected from birds at slaughter each in two tubes containing heparin The first sample was used to determine red and white blood cells counts (RBCs and WBCs) and packed cell volume (PCV) **(Bauer, 1970)**, hemoglobin (HB) **(Singh, 1983)**, the second tube was centrifuged to separate the plasma to determine plasma constituents calorimetrically using kits according to **Weichselbaum (1946)**, total protein; **Drupt (1977)**, albumin ; **Allain (1974)**, total cholesterol; **Werner *et al.* (1981)** triglycerides; **Trinder (1969)**, glucose; **Reitman and Frankel (1957)**, aspartate aminotransferase (AST) and alanine aminotransferase (ALT).

Table (1): Composition and chemical analysis of the grower and finisher diets.

Ingredient	grower diets				Finisher diets.			
	Control	3% DOC	6% DOC	9% DOC	Control	3% DOC	6% DOC	9% DOC
Yellow corn ,ground	63.75	60.00	56.50	52.50	66.50	63.00	59.00	57.00
Soybean meal (47 % CP)	31.28	31.28	31.28	31.28	28.00	28.00	28.00	27.00
Dried olive cake*	0.00	3.00	6.00	9.00	0.00	3.00	6.00	9.00
Vegetable oil	1.25	2.00	2.50	3.50	2.00	2.50	3.50	3.50
Dicalcium phosphate	1.70	1.70	1.70	1.70	1.60	1.60	1.60	1.60
Limestone	1.20	1.20	1.20	1.20	1.10	1.10	1.10	1.10
Salt	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Premix**	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
DL-Methionine	0.12	0.12	0.12	0.12	0.10	0.10	0.10	0.10
Total	100	100	100	100	100	100	100	100
Chemical composition % ***								
Crude protein	20.12	20.12	20.14	20.12	18.81	18.83	18.81	18.59
Ether extract	3.99	4.74	5.24	6.24	4.81	5.32	6.31	6.36
Crude fiber	2.62	3.60	4.58	5.55	2.56	3.54	4.51	5.48
Calcium	0.94	0.94	0.94	0.95	0.87	0.87	0.88	0.88
Available phosphorus	0.43	0.43	0.43	0.42	0.41	0.41	0.40	0.40
Lysine	1.04	1.03	1.03	1.02	0.94	0.94	0.94	0.90
Methionine	0.44	0.44	0.43	0.42	0.41	0.40	0.40	0.39
Methionine +Cystine	0.78	0.77	0.76	0.75	0.73	0.72	0.70	0.69
ME, (K cal / Kg)	3019	3042	3049	3087	3104	3111	3150	3134

* Proximate chemical analysis of dried olive cake: DM, 90.89; CP, 10.64; EE, 4.75; CF, 35.27; Ash, 10.23 and ME, 2540 K cal/kg , calculated according to **Carpenter and Clegg (1956)**

**Each 3.0 Kg of the Vit. and Min. premix contains: Vit. A,12000000 IU; Vit. D_3, 2000000 IU; Vit. E,10 g ; Vit. K, 1 g ; Vit. B_1 , 1 g ; Vit. B_2 , 5 g ; Vit. B_6 , 1.5 g ; Vit. B_{12} , 10 mg ; Biotin, 50 mg ; Folic acid , 1g ; Nicotinic acid, 30 g ; Ca pantothenate, 10 g ; Zn, 60 g ; Cu, 10 g; Fe, 35 g ; Co, 100 mg ; Se, 100 mg ; I, 300 mg ; Mn, 60 g. and antioxidant, 10g.

*** calculated according to **NRC (1994).**

Analysis of variance was computed using the general linear model (GLM) procedure of statistical analysis system **(SPSS, 1999)**. Differences among means were evaluated using Duncan's multiple range test **(Duncan, 1955)**.

RESULTS AND DISCUSSION

The performance of broiler chicks:

The performance of broiler chicks under the effect of dried olive cake are shown in Table (2). There was insignificant increase in LBWG at levels 3,6 % DOC compared to the control at the three intervals periods of the experiment. These results were similar to those of **AL-Shanti (2003)** on growing chicks at level 5% but the author found significant increase at the higher level (10% dried olive cake, DOC). Also, **Rupic *et al.* (1997)** found

increasing in body mass gain of pigs when fed diets contain 5 and 8 % dried olive cake compared with the control during the whole period (90 days).

Feed intake (FI) by broiler chicks during the whole experimental periods recorded an increase ($P<0.01$) with increasing DOC levels as shown in Table (2).This may be due to the improvement of the palatability or increased crude fiber content which causes a dilution of the nutrient content of the ration, therefore the birds consumed more feed in an attempt to meet their energy and other nutrient requirements **(Iyayi, *et al.*, 2005)**. These results agreed with those of **Abd El-Galil, *et al.* (2005)** which reported an increase ($P<0.01$) with increasing olive pulp from 5% up to 20% in Japanese quail diets. Also, the same author found the same results on rabbits. However, **AL-Shanti 2003** observed insignificant increase in FI of broiler chicks at 5 % and 10% DOC.

The results of feed conversion (FC) revealed insignificant difference among the experimental groups as shown in Table (2). These results agree with those of **AL-Shanti (2003)** of broiler chicks at level 5% DOC ,also, **Abd El-Galil *et al.* (2005)** found similar results on Japanese quail at level 10% olive pulp meal. And **Hashish and Abd El-Samee (2002)** reported no differences in FC between laying hens groups (0, 2.85 and 5.7% DOC). However, **AL-Shanti (2003)** found that, the level 10% DOC caused improve in the FC of broiler chicks. But, **Abd El-Galil *et al.* (2005)** found adverse effects on FC of Japanese quail at level 15% and 20% olive pulp meal

Dietary DOC (3,6 and 9%) had insignificant effect on the performance index of broiler chicks compared to the control as shown in Table (2).

Table (2): Effect of using dried olive cake on live body weight gain, feed intake, feed conversion and performance index of broiler chicks

Treatments	Levels of dried olive cake (DOC)			
	0	3%	6%	9%
LBWG (g)				
7- 28 day	980 ± 14.47^{a}	1017 ± 14.59^{a}	994 ± 14.59^{a}	973 ± 14.47^{a}
29-46 day	1388 ± 32.40^{a}	1425± 32.14^{a}	1416 ± 32.14^{a}	1345 ± 32.40^{a}
7- 46 day	2368 ± 41.24^{a}	2442± 41.24^{a}	2410 ± 41.24^{a}	2318 ± 40.10^{a}
FI(g/bird)				
7- 28 day	2051 ± 16.78^{C}	2135 ± 16.91^{AB}	2156 ± 16.91^{A}	2094 ± 16.78^{B}
29-46 day	3174 ± 30.31^{B}	3402 ± 30.10^{A}	3380 ± 30.10^{A}	3356 ± 30.10^{A}
7- 46 day	5225 ± 35.73^{B}	5537 ± 36.13^{A}	5536 ± 36.13^{A}	5450 ± 35.73^{A}
FC(FI, g/gain, g)				
7- 28 day	2.09 ± 0.03^{a}	2.10 ± 0.03^{a}	2.17 ± 0.03^{a}	2.15 ± 0.03^{a}
29-46 day	2.29 ± 0.05^{a}	2.40 ± 0.05^{a}	2.40 ± 0.05^{a}	2.49 ± 0.05^{a}
7- 46 day	2.21 ± 0.04^{a}	2.27 ± 0.04^{a}	2.30 ± 0.04^{a}	2.35 ± 0.04^{a}
PI	114.34 ± 3.08^{a}	114.23 ± 3.08^{a}	112.19 ± 3.01^{a}	105.27 ± 3.01^{a}

A ,B and C: means in the same row within the same item followed by different letters differed significantly at $P<0.01$

Plasma constituents:

Results of plasma constituents (Table, 3), revealed no significant differences in total proteins or albumin among the experimental groups. Similar results were found by **AL-Shanti (2003)** in broiler chicks at levels 5 and 10 % olive cake, and **Hashish and Abd El-Samee (2002)** in laying hens at levels 2.85 and 5.7% olive cake Also, **Abd El-Galil *et al.* (2005)** found similar results in Japanese quail at levels 10,15 and 20% olive pulp meal. There was a significant decrease in the globulin level of groups fed 3% and 6% DOC compared to the control and those fed the level 9% DOC (Table 3). However, **Abd El-Galil *et al.* (2005)** reported no significant differences in the values of globulin among Japanese quail groups fed 0, 5, 10, 15 and 20% olive pulp meal. Also, **Hashish and Abd El-Samee (2002)** found insignificant decrease in plasma globulin level in laying hens group fed the 10% DOC compared to those fed the 5% OC and the control.

The results of A/G ratio revealed that, levels 3 and 6% DOC caused high significant increase in A/G ratio of broiler chicks as compared to the control and 9% DOC groups. These results indicated that both levels 3and 6% DOC had better effects better than 9% DOC this may be due to the increase in the level of tannins with increasing the level of DOC. However, **Hashish and Abd El-Samee (2002)** observed insignificant increase in A/G ratio of laying hens at levels 2.85 and 5.7% DOC. Also, **Abd El-Galil *et al.* (2005)** found no differences in A/G ratio of Japanese quail at different levels (0,10,15 and 20 %) of olive pulp meal.

There is significant decrease in serum cholesterol of 6 % and 9% DOC fed groups compared to the control and 3% DOC fed groups. These results agreed with that obtained by **AL-Shanti (2003)** on broiler chicks at level 10% compared to the control and those fed the 5% DOC. Also, **Abd El-Galil *et al.* (2005)** found similar result in Japanese quail at level 20% compared to the low levels of olive pulp meal. A positive relationship between the dietary cholesterol intake and serum cholesterol is reported by **(Rawashdeh, 2002)** and the result of lower serum cholesterol, may be explained by olive oil enrichment in oleic acid that may bind to low density lipoprotein **(Lamuela *et al.*,2004)**. The results in Table (3) revealed that there is a decrease ($P<0.01$) in plasma triglycerides of broiler chicks fed diets contain 6 and 9% DOC compared to the control and those fed 3 % DOC. Also, **AL-Shanti (2003)** found decrease ($P<0.05$) in plasma triglycerides of broiler chicks at level 10 % DOC compared to the control and those fed the 5 % DOC.

Results of the plasma glucose level showed no differences among the experimental groups (0,3,6 and 9% DOC) Table, 3. Also, **AL-Shanti (2003)** found similar results on broiler chicks at different levels (0,5 and 10%) of DOC.

No significant differences were found among the groups fed 3, 6 and 9% DOC in the values of serum liver enzymes (AST and ALT). **Abd El-Galil *et al.* (2005)** found similar results on laying hens up to 10% olive pulp meal of

ALT and up to 15 % of AST, and the over level olive pulp meal (20%) caused adverse effects on liver function.

Hematological parameters:

The results of hematological parameters [PCV %, HB %, RBCs (10^6) and WBCs (10^3)] in Table (3) revealed no adverse effects on these parameters due to inclusion of DOC with different levels (3,6 and 9%) in the diet of broiler chicks. Similar results was obtained by **Rupic *et al.* (1999)** on rabbits that fed on 10 and 20% DOC.

Carcass traits:

Results on carcass traits (carcass % Giblet % and dressing %) in Table (4) denoted no differences among various groups fed 3,6 and 9% DOC. Same results were reported by **Abo Omar (2005)** on broiler chicks were fed 2.5, 5.0, 7.5 and 10% olive pulp. Also, **AL-Shanti (2003)** found no differences in carcass % of broiler chicks fed 5 and 10% DOC ,but found significant increase in giblets % compared to the control.

Table (3): Effect of using dried olive cake on concentrations of plasma constituents and hematological parameters of broiler chicks

Treatments	Levels of dried olive cake			
	0	3%	6%	9%
Total protein (g/100 ml)	3.87 ± 0.26 ^{a}	3.68 ± 0.26 ^{a}	3.33 ± 0.26 ^{a}	3.83 ± 0.26 ^{a}
Albumin (g/100 ml)	2.31 ± 0.08 ^{a}	2.45 ± 0.08 ^{a}	2.30 ± 0.08 ^{a}	2.34 ± 0.08 ^{a}
Globulin (g/100 ml)	1.57 ± 0.13 ^{a}	1.23 ± 0.13 ^{b}	1.03 ± 0.13 ^{b}	1.49 ± 0.13 ^{a}
A/G Ratio	1.47± 0.19 ^{B}	1.99 ± 0.19 ^{A}	2.23 ± 0.19 ^{A}	1.57± 0.19 ^{B}
Cholesterol (mg/100 ml)	265.58 ± 16.65 ^{a}	212.60 ± 16.65 ^{ab}	175.93 ± 16.65 ^{b}	196.35 ± 16.65 ^{b}
Triglycerides (mg/100 ml)	143.46 ± 5.99 ^{A}	138.48 ± 5.18 ^{A}	109.31 ± 5.18 ^{B}	112.75± 5.99 ^{B}
Glucose (mg/100 ml)	300.19± 17.78 ^{a}	293.33± 17.78 ^{a}	288.00± 17.78 ^{a}	307.84 ± 17.78 ^{a}
AST(U/l)	191.48±10.71 ^{a}	201.43±13.83 ^{a}	216.23±11.98 ^{a}	216.93±11.98 ^{a}
ALT(U/l)	14.52 ±1.62 ^{a}	14.30 ±1.81 ^{a}	15.40 ±2.00 ^{a}	15.40 ±1.81 ^{a}
PCV %	32.04 ±1.34 ^{a}	31.59±1.34 ^{a}	31.68±1.34 ^{a}	29.72 ±1.34 ^{a}
HB %	12.77± .35 ^{a}	13.12± .35 ^{a}	12.59± .35 ^{a}	12.01± .35 ^{a}
RBCs (10^6)	3.41 ± .18 ^{a}	3.39± ± .18 ^{a}	3.32± .18 ^{a}	3.08± .18 ^{a}
WBCs (10^3)	22.52± 3.03 ^{a}	24.15± 3.03 ^{a}	25.69± 3.03 ^{a}	21.91± 3.03 ^{a}

a, b and A, B: means in the same row within the same item followed by different letters differed significantly (at P<0.05 for a and b ; P<0.01 for A and B)

Table (4): Effect of using dried olive cake on carcass traits of broiler chicks.

Treatments	Levels of dried olive cake			
	0	3%	6%	9%
Body weight	2540.98±127.56 ^{a}	2566.67±127.56 ^{a}	2491.67±127.56 ^{a}	2475.00±127.56 ^{a}
Carcass %	68.97± 0.87 ^{a}	69.42 ±0.87 ^{a}	66.67±0.87 ^{a}	68.55±0.87 ^{a}
Giblets %	4.48± 0.13 ^{a}	4.52± 0.13 ^{a}	4.62± 0.13 ^{a}	4.36± 0.13 ^{a}
Dressing %	73.45± 0.84 ^{a}	73.94± 0.84 ^{a}	71.23± 0.84 ^{a}	72.36± 0.84 ^{a}

a ...values in the same row within the same item followed by same letters not differed significantly at P>0.05.

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تأثير استخدام كسبة الزيتون الجافه على بعض القياسات الفسيولوجية لبدارى التسمين

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تم إجراء هذه التجربة لدراسة تأثير استخدام كسبة الزيتون الجافة على بعض الصفات الفسيولوجية لبدارى التسمين. تم توزيع ٢٥٠ كتكوت غير مجنس من سلالة روص ٣٠٨ عمر اسبوع عشوائيا إلى اربعة مجاميع (٦٢،٦٢،٦٣، ٦٣) وكل مجموعة مقسمة إلى ٣ مكررات وصممت التجربة بحيث تشمل مجموعة الكنترول وهي الأولى وثلاث مستويات من كسبة الزيتون الجافة وهم ٣، ٦، ٩% في تصميم عاملي. وغذيت الكتاكيت على علائق نامي من عمر ٧-٢٨ يوم وعلائق ناهي من عمر ٢٩-٤٦ يوم وسكنت الكتاكيت ارضيا وقدم لها الماء والغذاء حتى الشبع. وكانت النتائج كالتالي: المستويات المختلفة من كسبة الزيتون الجافة لم يكن لها تأثير معنوي على الزيادة في وزن الجسم الحي، معدل التحويل الغذائي، دليل الأداء الإنتاجي، البروتينات الكلية بالبلازما، نسبة الألبيومين، الجلوكوز، انزيمات الكبد، القياسات الطبيعية للدم وصفات الذبيحة. في حين أن المستويات المختلفة من كسبة الزيتون الجافة سببت زيادة معنوية جدا في كمية الغذاء المأخوذ بواسطة هذه المجاميع مقارنا بمجموعة الكنترول. المجاميع المغذاة على ٣ ، ٦% كسبة الزيتون الجافة كان بها نقص معنوي في جلوبيولين البلازما ولكن هذه المجاميع كان بها زيادة معنوية جدا في نسبة الألبيومين : الجلوبيولين مقارنا بمجموعة الكنترول و المجموعة المغذاة على ٩% كسبة الزيتون الجافة. في حين أن المجاميع المغذاة على ٦ ،٩% كسبة الزيتون الجافة كان بها نقص معنوي في الكوليستيرول الكلي بالبلازما وايضا هذه المجاميع كان بها نقص معنوي جدا في الجليسريدات الثلاثية بالبلازما مقارنا بمجموعة الكنترول والمجموعة المغذاة على ٣% كسبة الزيتون الجافة.

الكلمات الدالة: بدارى التسمين، كسبة الزيتون الجافة، الأداء الإنتاجي، مكونات البلازما، القياسات الطبيعية للدم، صفات الذبيحة.