Egyptian J. Desert Res., 57, No.2, 371-385 (2007)

UTILIZATION OF OLIVE PULP MEAL IN LAYING JAPANESE QUAIL DIETS

Abd El-Galil, K.; Heba S. Aboul Ezz* and Henda A. Mahmoud
Animal and Poultry Nutrition Dept., Desert Research Center, El-Matariya, Cairo, Egypt.
*Zoology Dept., Faculty of Science, Cairo University, Giza, Egypt.

A total number of 120 Japanese quail (80 females and 40 males) at 4 weeks of age were used in an experiment lasted 22 weeks. The experiment aimed to study the utilization of olive pulp meal (OPM) as a cheap untraditional feedstuff on productive performance of laying Japanese quail. Quail were classified into 4 equal experimental groups of 20 females each. The OPM was used at a percentage of 0,10,15 or 20 % in the diets. The experimental diets were isonitrogenous (20 % crude protein) and isocaloric Metabolizable Energy (ME) (2900 kcal/kg). At 15 weeks of age, males were transferred to female cages (one male per two female) for twenty minutes for five days, the eggs were then collected and incubated.

The final live body weight and body weight change during the productive performance period varied significantly (P<0.05) among the experimental groups. The highest body weight and body weight change were recorded by using 10 % OPM, while 20 % recorded the lowest one.

The first egg weight and age at sexual maturity recorded a non-significant difference between groups.

Egg weight, egg number and egg mass during the whole experimental period recorded a significant difference (P<0.05) between groups

Feed intake (g/day) increased significantly (P<0.05) with the increasing of OPM levels.

Feed conversion ratio (g feed/g egg mass) revealed a significant difference (P<0.05) among the experiment groups. It is clear that substitution of diet by 20 % OPM recorded worst feed conversion ratio than that other groups.

Hatchability percentage recorded a non significant difference among groups, where the 10 % OPM level showed the best values.

Different levels of OPM in the diets show significant (P<0.05) decrease in albumen, yolk index and increase in yolk, egg shape percentage and shell thickness.

Digestibility coefficients of Organic Matter (OM), Crude Protein (CP), Crude Fiber (CF), Nitrogen Free Extract (NFE) and the nutritive values expressed as Digestible Crude Protein (DCP), Total Digestible Nutrients (TDN)% and (ME) (kcal/kg) varied significantly among the experimental groups.

The 10 % OPM group showed the best net return as well as the highest value of economic efficiency among the experimental groups.

Keywords: Quail, olive pulp meal, productive performance, egg quality, digestibility and economical efficiency.

In Egypt, major gap exists between the requirements and supplies of feeding in poultry. The shortage of feeds is one of the major limiting factors for increasing of production, in the same time, feed cost represents the major part of total cost. Using untraditional feeds can substantially participates in solving this problem and decreases the cost of feeding which in turn decreases the marketing price of poultry production.

Recently, the application of non-conventional feedstuffs in poultry nutrition in developing countries has received considerable attention with increasing of poultry feed cost.

Many available agro-industrial by-products such as olive pulp meal as cheap untraditional feedstuffs are prevailing in the desert and recently the newly reclaimed areas. It can be used in feeding laying quail as a particle substitute for the conventional feedstuffs, as cheap untraditional feedstuffs.

Olive pulp meal (OPM) is rich in oleic acid but has moderate amounts of linoleic and palmitic acids. Moreover, it is poor in linolenic and lauric acids (Nefzaui, 1985). The previous author reported that OPM contains several amino acids, the most abundant were glutamic and aspartic acids and it was limited in lysine, histidine and methionine. It also contains moderate amounts of arginine. Fedeli (1988) illustrated that olive oil contained high percentages of mono-unsaturated fatty acid (oleic acid) and low percentage of saturated fatty acids. Morgan and Trinder (1980) reported that olive pulp appeared to be a good source of Cu, Ca and Co and lower in P, Mg and Na. Razzaque and El-Sheikh (1980) reported that olive pulp is fairly rich in essential elements and minerals especially K, Cu, Mn and Zn.

There are some researches to incorporation OPM in poultry diets, in broiler chicks (Ahmed, 1998; Abd El-Maksoud, 2001 and Attia *et al.*,2001), in laying hen (Samia and Laila, 2002 and Al-Shanti,2003), in rabbits (Tortuero *et al.*,1989; Ghazalah and El-Shahat, 1994; El-Kerdawy, 1997 and Abd El-Galil, 2001).There is no available data on the use of OPM in diets of laying quail.

The main purpose of this study was to utilize olive pulp meal as agro-industrial by-products on productive performance in laying Japanese quail diets.

MATERIALS AND METHODS

The present experiment was carried out at Maryout Experimental Research Station (South West Alexandria), which belongs to the Desert Research Center. A total number of 120 Japanese quail (80 females and 40 males) of 4 weeks age were used in an experiment lasted 22 weeks. Experimental Japanese quail (*Coturnix coturnix japonica*) were kept under similar managerial, hygienic and environmental conditions and were divided randomly into four equal experimental groups (20 females in each group).

Quail were kept in batteries, which were divided into separate cages, where two females were housed in each cage. The first group was fed the basal diet as a control (0 % OPM), while the other three groups were fed diets containing either 10,15 or 20 % OPM. The quail were housed in cages at 4 weeks till 22 weeks of age.

The experimental diets (Table 1) were formulated according to N.R.C (1994) and were isonitrogenous (20% crude protein) and isocaloric (2900 kcal ME/kg). Feed and water were offered *ad libitum*. Chemical analysis of OPM, the experimental diets and dried excreta were assayed using methods of A.O.A.C (1990).

The proximate chemical analysis of OPM was 9.24 % CP, 18.45 % CF, 9.71 % EE, 42.58 % NFE and 7.54 % ash.

During the experimental period, individual live body weight and feed intake were determined biweekly. Feed conversion ratio (g feed intake / g egg mass) was calculated and the mortality was recorded every day.

Age at sexual maturity was determined at the first egg laying. Eggs were collected daily and weighed for each group, so egg number, egg mass were calculated during the experimental period. At 15 weeks of age, 20 eggs were randomly taken from each group and were used to evaluate egg quality, yolk weight and shell weight and the obtained data were recorded. Shell thickness (without membrane) was measured by micrometer, while albumen weight was calculated by subtracting yolk and shell weight from egg weight. Yolk, shell and albumen percentage were calculated as a percentage of egg weight.

Males were housed individually in cages (one quail per cage) and fed the same diets for females. At 15 weeks of age, 40 males were transferred to female cages (one male per two female) for twenty minutes for five days, the eggs were then collected and incubated. Hatchability percentage was calculated for each group.

Table (1). Composition and proximate chemical analysis of the experimental diets.

Ingredients, %	Levels of olive pulp meal			
	Control (0)	10%	15%	20%
Olive Pulp meal	0.00	10.00	15.00	20.00
Yellow corn	59.84	55.00	51.55	47.16
Soybean meal (44% CP)	6.50	9.33	9.35	6.00
Concentrate*	10.00	10.00	10.00	10.00
Corn gluten meal (60% CP)	9.70	8.00	8.52	11.20
Wheat bran	8.44	2.12	0.00	0.00
Limestone ground	4.30	4.30	4.30	4.30
Dicalcium phosphate	0.50	0.50	0.52	0.53
Vit. and min. premix**	0.30	0.30	0.30	0.30
L-lysine	0.20	0.19	0.20	0.25
Dl- methionine	0.22	0.26	0.26	0.26
Total	**100**	**100**	**100**	**100**
Proximate chemical analysis %				
Crude protein	20.21	20.13	20.32	20.25
Crude fiber	3.35	4.16	4.75	5.39
Ether extract	3.98	4.18	4.50	5.20
Calculated values				
Metabolizable energy (kcal/kg)***	2900	2901	2903	2900
Calcium %	2.51	2.52	2.51	2.52
Available phosphorus %	0.30	0.30	0.30	0.30
Methionine %	0.46	0.45	0.45	0.45
Lysine %	1.00	1.00	1.00	1.00
Methionine + Cystin %	0.70	0.70	0.70	0.70
Price /kg diet (L.E.)****	1.38	1.32	1.27	1.23

* Protein concentrate contained, 52 %Crude protein, 2.03% Crude fiber, 6.17% Ether extract, ME 2800 (kcal/kg), 1.50 % Methionine,2.0% Methionine & Cystin, 3.0 %Lysine 7.00% Calcium, 2.93 % Available Phosphorus and 2.20 % Nacl.

** Each 3 kg Vitamins and minerals premix contains (per ton of feed), Vit. A 10000000 IU, Vit. D_3 2000000 IU, Vit.E 10g, Vit.K_3 1000 mg, Vit. B_1 1000 mg, Vit. B_2 5000mg, Vit. B_6 1.5g, Vit. B_{12} 10 mg, Pantothenic acid 10g, Niacin 30g, Folic acid 1g, Biotin 50 mg, Iron 30g, Manganese 70g, Choline chlorite 10g, Iodine 300 mg, Copper 4g, Zinc 50g and Selenium 100 mg.

*** Calculated according to NRC of poultry (1994) and metabolizable energy of OPM 2451 kcal/kg according to Abd El-Galil *et al.*(2005).

****Calculated according to price of feed ingredients at the same time of the experiment.
Price of one-ton olive pulp meal 320 L.E.

At the end of the experimental feeding period, digestion trials were conducted using 20 adult quail males (five quail from each treatment) to determine the digestibility coefficients and the nutritive values of the experimental diets as affected by OPM levels. Males were housed individually in metabolic cages. The digestibility trials extended for 9 days where 5 days as a preliminary period then followed by 4 days as collection period. The individual live body weights were recorded during the main collection period to determine any loss or gain in the live body weights. During the main period, excreta were collected daily and weighed dried at $60^{o}C$ bulked, finally ground and stored for chemical analysis. The faecal nitrogen was determined according to Jakobsen *et al.*(1960). Urinary organic matter was calculated according to Abou-Raya and Galal (1971).

The digestion coefficients % of dry matter (DM), organic matter (OM), crude protein (CP), crude fiber (CF), ether extract (EE) and nitrogen free extract (NFE) of the experimental diets were estimated.

The nutritive values expressed as digestible crude protein (DCP), total digestible nutrients (TDN) were calculated. Metabolizable energy (ME) was calculated as 4.2 kcal per gram TDN as suggested by Titus (1961).

The economical efficiency of feed was calculated from the input-output analysis based upon the differences in feed conversion ratio and feeding cost/kg egg.

Statistical analysis was carried out using General Linear Model (GLM) procedures by SAS program (1996) using simple one-way analysis of variance according to this model:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where:

Y_{ij} = Represented observation in j^{th} OPM level.

μ = Overall mean.

T_i = Effect of j^{th} OPM level (j = 0,10,15, 20%).

e_{ij} = Random error.

Duncan's New Multiple Range Test (Duncan, 1955) separated differences among treatment means.

Regression equations analysis of egg weight, egg number, egg mass and feed intake were undertaken to clarify the relation between these parameters and OPM content in the experimental diets.

RESULTS AND DISCUSSION

Live Body Weight and Body Weight Change

Effect of feeding levels on OPM in productive performance by quail females is summarized in table (2). The final live body weight and body weight change during the whole experimental period varied significantly ($P<0.05$) among the experimental groups.

It is worthy noting that live body weight was improved with increasing the OPM level in the diet at 10 % and it is gradually decreased with elevating it up to 20 %. Feeding quail on 10 % OPM recorded live body weight improvement 2.30% higher than that of the control group, while the feeding one on 15% or 20 % OPM resulted in 0.63% and 2.03% lower than that of the control group, respectively.

It is worthy noting that feeding quail on 10 % OPM resulted in 2.87 % higher in body weight change than that of the control group, while increasing the OPM level to 20% resulted in 8.41% and 5.78% lower than that of 10% and the control group, respectively.

This reduction may be due to its higher content of crude fiber and attributed to lignin content in diets, which reduced digestibility and availability of nutrients. Attia *et al.* (2001) reported that body weight gain of broiler chicks recorded non-significant increase after feeding diets containing OPM up to 16% level, while Al-Shanti (2003) recorded a significant increase in body weight gain for growing chicks fed on 10% OPM.

Age at Sexual Maturity

Sexual maturity age ranged from 49.20 to 50.01 day, showing that OPM levels in laying quail diets did not affect this trait as shown in table (2).

Weight of First Egg

Results of first egg weight were found to be statistically insignificant as shown in table (2). It is noting that feeding quail on 20 % OPM recorded higher values compared to other experimental groups.

Table (2). Effect of feeding by different levels of olive pulp meal on the productive performance ($\bar{X}$ ±SE) of laying quail.

Items	Levels of olive pulp meal				Sig
	Control (0)	10 %	15 %	20 %	
Initial live body weight (g)	115.49±6.53	117.38±5.67	116.88±7.01	118.21±6.51	ns
Final live body weight (g)	250.83±4.51^{a}	256.61±4.65^{a}	249.25±7.51^{ab}	245.73±9.52^{b}	*
live body weight change (g)	135.34±2.78^{a}	139.23±3.01^{a}	132.37±3.62^{ab}	127.52±4.01^{b}	*
Age at sexual maturity/ bird/day	49.20±0.11	49.32±0.13	49.55±0.13	50.01±0.15	ns
First egg weight(g)	11.40±0.05	11.46±0.04	11.51±0.06	11.55±0.07	ns
Egg weight (g)	11.35±0.11^{b}	11.45±0.08^{ab}	11.52±0.09^{a}	11.58±0.15^{a}	*
Egg number/ bird / day	0.63±0.02^{a}	0.64±0.03^{a}	0.61±0.07^{ab}	0.57±10.09^{b}	*
Egg mass (g)/ bird/day	7.15±0.05^{a}	7.33±0.03^{a}	7.03±0.08^{ab}	6.60±0.11^{b}	*
Feed intake (g)/ bird/day	29.23±0.11^{b}	30.08±0.12^{ab}	31.01±0.13^{a}	31.42±0.15^{a}	*
Feed conversion ratio	4.09±0.05^{b}	4.10±0.06^{b}	4.41±0.07^{ab}	4.76±0.09^{a}	*
Morality rate %.	0.00	0.00	0.00	0.00	
Hatchability %	80.12±5.82	81.08±8.20	80.18±9.20	78.68±11.50	ns

^{a,b}: Means within a row with different superscripts are significantly different.
Sig.= Significance. *= (P< 0.05). n.s = not significant.

Egg Weight

Egg weight during the whole experimental period was significant (P<0.05) among the experimental groups. It is noting that substitution of diet by 20% OPM recorded an increase in egg weight amounted to 1.14% or 2.03% higher than that of 10% OPM or the control group, respectively. While this increase amounted to 0.88% between 10% OPM and the control one. The control diet and the 10% OPM level recorded the lowest egg weight compared to other experimental groups, respectively, which may be attributed to the decrease in feed intake and earlier sexual maturity as shown in table (2). Egg weight was negatively correlated with egg production and early egg weight in production of quail (Strong *et al.*, 1977).

Regression equation was obtained for egg weight (Ew) as function of their OPM content. This relationship was defined by the following equation:

$$Ew = 11.35+0.01X$$

$$r^2 = 0.97, (P<0.05)$$

Where: X = levels of olive pulp meal.

Egg Number and Egg Mass

Results in table (2) indicated that egg number and egg mass during the whole experimental period were significant (P<0.05) among the experimental groups. It is worthy noting that egg number decreased with increasing levels of OPM in diet. The egg number was higher in birds receiving 10% attributed to other experimental groups, this may be the effect of earlier sexual maturity.

Regression equation was obtained for egg number (EN) by the following equation:

$$En = 0.64-0.003 X$$

$$r^2 = 0.67, (P<0.05)$$

Where: X = levels of olive pulp meal.

This result agreed with the finding of Samia and Laila (2002) who reported that after feeding laying hens on diets containing 10% OPM, egg weight recorded non significant decrease in comparison with the control group.

Egg mass (EM) recorded maximum values for 10% OPM and minimum values of 20% OPM level in the diets.

It is noting that feeding quail on 10% OPM resulted 2.52% higher in EM than that of the control group, while increasing the OPM level to 20% resulted the lowering of EM by 9.96 and 7.69% rather than that were feeding on 10% OPM and the control group, respectively. However, the increase in EM with the 10% OPM level was expected in view of the increase in egg number and vice versa with the 20% OPM level and it is observed that EM decreased with increasing OPM levels.

Regression equation was obtained for egg mass as function of their OPM content. This relationship was defined by the following equation:

$$Em = 7.31-0.03 X$$

$$r^2 = 0.60, (P<0.05)$$

Where: X = levels of olive pulp meal.

From the present results, it is clear that the 10% OPM group recorded the highest egg number and egg mass as shown in table (2).

Feed Intake and Feed Conversion Ratio

Feed intake (g/day) during the whole experimental period was increased significantly ($P<0.05$) among the experimental groups. It is clear that increasing OPM levels in the experimental diets, increased the feed intake. The substitution of the diet with 10, 15 or 20 % OPM increased feed intake by 2.91, 6.09 and 7.49 % respectively, more than that of the control group.

Regarding the amount of feed intake by the experimental quail, it is observed that feed intake increased significantly ($P<0.05$) with increasing of OPM levels.

Regression equation was obtained for feed intake (FI) as a function of their OPM content. This relationship was defined by the following equation:

$$FI = 29.16 + 0.11\ X$$

$$r^2 = 0.97,\ (P<0.05).$$

Where: X = levels of olive pulp meal.

This increase in feed intake may be due to its crude fiber content, which reduce digestibility and nutritive values, the birds have the ability to regulate their energy requirements by increasing feed intake to certain extent.

These results are in agreement with those of Abd El-Galil *et al.*(2005) who obtained significant ($P<0.05$) increase in FI by using different levels of OPM in the diet of growing quail up to 20%. Attia *et al.*(2001) reported that increase ($P<0.01$) in feed intake of broiler may be due to the improvement of palatability after incorporation of olive pulp in the diets up to 16 %. Abd El-Galil (2001) found an increase ($P<0.05$) in feed intake by rabbits with increasing OPM levels in their diets up to 20%.

Results obtained of feed conversion ratio (g feed /g egg mass) revealed significantly ($P<0.05$) decreased with increasing of OPM level in diet (Table 2).

It is clear that the 10% OPM level was better than 15% or 20%. The improvement in feed conversion ratio of 10 % OPM, may be due to its highest egg mass as compared to that of OPM levels till 20%.

The present results are in agreement with those of Samia and Laila (2002) who reported a non-significant decrease in feed conversion ratio by laying hen with 10% OPM. Al-Shanti (2003) reported an improvement in feed conversion ratio for broiler diets containing 10% OPM.

From the present results, it is clear that using 10 % OPM in feeding laying quail recorded the highest egg number and egg mass without significant increase in feed intake and feed conversion ratio.

Morality Rate

No incidence of mortality occurred during the experimental period as well as no effects of incorporation of OPM levels on the experimental diets.

Hatchability

Data concerning hatchability percentage of total eggs in quail fed different levels of OPM recorded a non-significant difference between groups. All groups had nearly similar values of hatchability ranging from 78.68 to 80.12 %, it decreased with increasing of OPM levels (Table 2).

Egg Quality Traits

Data of egg quality indicate that relationship between levels of OPM and egg quality as shown in table (3). Data of yolk percentage and shell thickness showed a non-significant increase among the experimental groups. On the other hand, egg weight, albumen, eggshell, yolk index, egg shape percentage were significantly varied (P<0.05) among the experimental groups.

Table (3). Egg quality ($\bar{X}$ ±SE) as affected by olive pulp meal level in laying quail diets.

Items	Levels of olive pulp meal				Sig.
	Control (0)	10 %	15 %	20 %	
Egg weight (g)	11.56 ± 0.04^{b}	11.59 ± 0.05^{ab}	11.84 ± 0.09^{ab}	12.01 ± 0.11^{a}	*
yolk %	31.15±0.05	31.20±0.10	31.27±0.12	31.39±0.09	ns
Albumen %	55.46 ± 0.07^{a}	55.48 ± 0.09^{a}	54.72 ± 0.09^{ab}	54.40 ± 0.10^{b}	*
Egg shell %	13.39 ± 0.02^{ab}	13.32 ± 0.05^{b}	14.01 ± 0.07^{a}	14.20 ± 0.10^{a}	*
yolk index %	48.74 ± 0.03^{a}	48.94 ± 0.05^{a}	47.55 ± 0.09^{ab}	46.76 ± 0.11^{b}	*
Egg shape %	78.98 ± 0.01^{ab}	78.68 ± 0.02^{b}	80.01 ± 0.02^{a}	81.04 ± 0.01^{a}	*
Shell thickness (mm)	0.241±0.03	0.241±0.05	0.242±0.03	0.245±0.04	n.s

a,b: Means within a row with different superscripts are significantly different. Sig.=Significance, *= (P< 0.05), n.s = not significant.

Digestibility and Nutritive Values of the Experimental Diets

Digestion coefficients of nutrients content as affected by the levels of OPM are illustrated in table (4) and fig. (1). Results indicated a highly significant (P<0.01) decrease in digestibility coefficients of crude protein (CP) and crude fiber (CF) by the increasing of OPM in the experimental diets. On the other hand, significant differences (P<0.05) were noticed in digestibilities of organic matter (OM), ether extract (EE) and nitrogen free extract (NFE) among the experimental diets.

Nutritive values expressed as DCP, TDN% and ME (kcal/kg) of the experimental diets were gradually decreased (P<0.05) with increasing of OPM level in the diet.

The observed decrease in nutritive values due to the increase in OPM level inclusion may be attributed to the decreasing in digestion coefficients of nutrients in OPM.

The decrease in digestibility of CP and CF may be attributed to lignin content of OPM and the fact that most of its total nitrogen is linked to lignocelluloses, two main factors which are limiting the digestive utilization of olive residues (Aguilera, 1987). Nefzaui (1985) estimated fiber fractions in OPM as 59.6, 71.80, 12.10, 28.80 and 30.90% for acid detergent fibers, neutral detergent fibers, hemicellulose, cellulose and lignin, respectively. Also, probably caused by the presence of tannins, which may adversely affect the nutrition of herbivores through inhibition of digestion as suggested by Robbins *et al.* (1987).

These results were supported by Reed *et al.* (1990) who reported that tannin may reduce cell wall digestibility by forming indigestible complexes with cell wall carbohydrate. Martin *et al.* (2003) reported that olive pulp containing 1.4% tannins, on dry matter (DM) basis.Tannins are naturally occurring as polyphenolic compounds or complexes with macromolecules (proteins, cellulose, hemicellulose, starch), minerals and vitamins which affect their availability in man and animals (Makkar, 1993). Also, tannins reduce the amino acid (Armstrong *et al* .,1974) and metabolizable energy of diet (Gous *et al*.,1982).

Table (4). Digestibility coefficients and nutritive values ($\bar{X}$ ±SE) of the experimental diets as affected by olive pulp meal level.

Items	Levels of olive pulp meal				Sig
	Control (0)	10%	15%	20%	
Apparent digestion coefficients %					
OM	80.05±1.22^{a}	80.32±1.22^{a}	77.71±1.60^{ab}	75.26±1.41^{b}	*
CP	81.98±1.22^{a}	79.51±1.38^{a}	76.42±2.45^{ab}	72.30±2.70^{b}	**
CF	24.86±1.04^{a}	21.42±1.05^{a}	17.16±1.06^{b}	15.60±1.10^{b}	**
EE	86.63±1.82^{b}	86.904±0.81^{ab}	87.94±0.72^{a}	88.69±0.80^{a}	*
NFE	87.89±1.10^{a}	86.19±0.40^{a}	84.88±0.33^{ab}	83.02±1.21^{b}	*
Nutritive values					
DCP%	16.57±0.34^{a}	16.01± 0.42^{a}	15.53 ±0.30^{ab}	14.64±0.51^{b}	*
TDN%	64.86±1.21^{a}	63.09±2.01^{a}	61.75±1.53^{ab}	60.64±1.62^{b}	*
ME (kcal/kg)	2724±12.20^{a}	2650±16.10^{ab}	2594±14.57^{b}	2547±19.80^{b}	*

^{a,b}: Means within the same row showing different letters are significantly different. Sig.=Significance,*=(P<0.05),**=(P<0.01).

Streeter *et al.* (1993) found that tannins reduce digestibility of protein and carbohydrate by inhibiting digestive enzymes and by altering permeability of the gut wall. So, the decrease in digestion coefficients and nutritive values in this study may be attributed to these factors.

The present results are in agreement with those of Abd El-Galil *et al.* (2005) who found this reduction (P<0.01) in digestibility of CF%, CP % and nutritive values by feeding growing quail on OPM diets. Also, Abd El-Maksoud (2001) reported that increasing OPM up to 12% in the diet of broiler chicks decreased significantly the digestion coefficients of CP, CF, EE% and nutritive values.

It is of great importance to note that results of the digestion trial coincided generally with the differences in productive performance and feed utilization in quail birds.

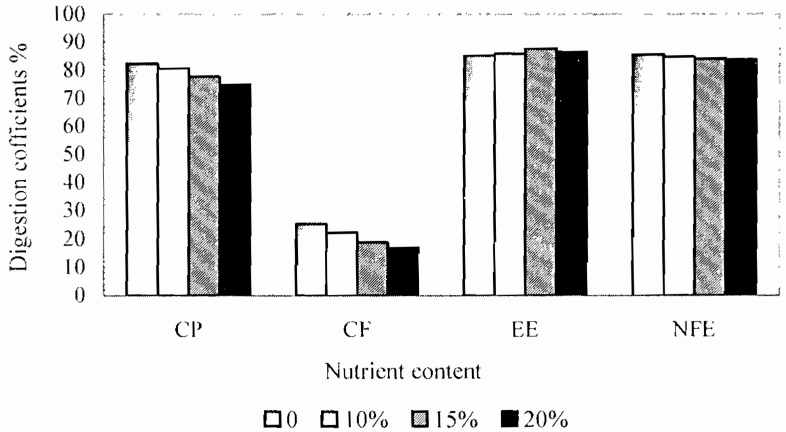

Fig.(1) : Digestion cofficients of experimental diets of quail fed diets containing different levels of OPM

Economic Efficiency

Results indicated that cost of kg feed decreased gradually with increasing the levels of OPM. The present results indicated that, 10% OPM is the best level in feeding laying quail as it produced the highest net return and highest economic efficiency compared to the other experimental groups. It was noticed that 20% OPM gave the lowest economic efficiency. In addition, the relative economic efficiency increased after incorporation of 10 and 15%, while 20% OPM decreased the relative economic efficiency in the diet of quail in comparison with the control group as shown in table (5) and fig (2).

Table (5). Economic efficiency as affected by olive pulp meal level in laying quail diets.

Items	Levels of olive pulp meal			
	Control (0)	10%	15%	20%
Feed conversion ratio	4.09	4.10	4.41	4.76
Cost of kg feed (L.E.)	1.38	1.32	1.27	1.23
Feed cost of kg egg (L.E.)	5.64	5.41	5.60	5.85
Market price of one kg egg (L.E.)	10	10	10	10
Net return (L.E.)	4.36	4.59	4.40	4.15
Economic efficiency of feed	77.30	84.84	78.57	70.94
Relative economic efficiency	100	109.75	101.64	91.77

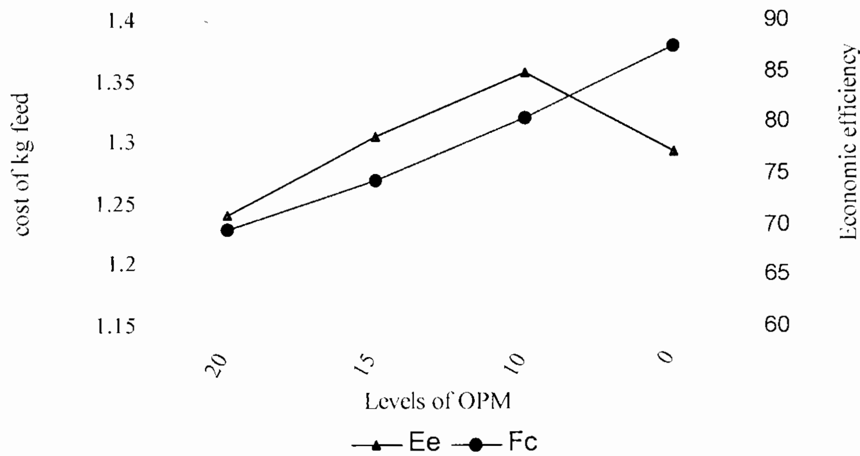

Fig. 2 : Economic efficiency (Ee) and cost of kg feed (Fc) of different levels of OPM by laying quail

CONCLUSION

In general, it could be recommended to use of OPM in laying quail diets up to 10% without detrimental effects on productive performance and economical efficiency.

REFERENCES

Abd El-Galil, K.(2001). Utilization of olive pulp meal in feeding growing rabbits. *J. Agric. Sci.* Mansoura Univ., 26 (2):727-736

Abd El-Galil,K.; Heba S. Aboul Ezz and Henda A. Mahmoud (2005). Utilization of olive pulp meal as a feedstuff in growing Japanese quail diets. *J. Agric. Sci.* Mansoura Univ., 30 (12): 7313-7325.

Abd El-Maksoud , A. M.(2001).Nutritive evaluation of some agro- industrial by-products and its utilization in feeding broiler chicks. *Ph.D. thesis*, Fac. Agric., Zagazic Univ., Egypt.

Abou-Raya, A.K. and A.G.H.Galal (1971). Evaluation of poultry feeds in digestion trials with reference to some factors involved. U.A.R. *J. Anim. Prod.*, 11(1): 207-221.

Aguilera .J.F. (1987). Improvement of olive cake and grape by-products for animal nutrition. *Proceedings of a workshop held in lelystacd, Netherland.*

Ahmed, K.L. (1998). Nutritional studies on non-conventional feeds in poultry nutrition in Sinai. *Ph.D. thesis*, Fac. Agric., Suez Canal Univ., Egypt.

Al-Shanti, H.A. (2003). Effect of using olive cake or extracted full fat soybean in broiler chicks diets. *Egypt. Poult. Sci.*, 23 (1): 1-13.

Armstrong, W.D. ; J.C. Rogler and W.R. Featherston (1974).In vitro studies of the protein digestibility of sorghum grain. *Polt.Sci.*, 53:22-24.

A.O.A.C., Association of Official Analytical Chemists (1990). In "*Official Methods of Analysis*", 15th.ed., Washington, USA.

Attia, A.I.; A.W. El-Anwar and M.N. Soliman (2001). Effect of olive pulp supplemented with or without enzyme on growth performance and carcass characteristics of broiler chicks. *Proceedings of the 8th Sci., conf. on Animal Nutrition* , Organized by *Egyptian J. Nut. and Feeds*, 2 (4): 967-978.

Duncan, D. B. (1955). Multiple range and multiple F-tests. Biometrics, 11:1-42

El-Kerdawy, D.M.A. (1997). Olive pulp as a new energy source for growing rabbits. *Egyptian J. Rabbit Sci.*, 7 (1): 1-12.

Fedeli, E. (1988).The behaviour of olive during cooking and frying. In "*frying of food*". Varela, G.; Render, A.E. and Morton, I.D.; Editors. Ellis Horwood Ltd., Chichester, England.

Ghazalah, A.A. and A.A. El-Shahat, (1994). Digestability and acceptability of some agro-industrial by-products by rabbits. *Egypt. Poult. Sci.*, 14: 401-424.

Gous, R.M.; M.A.Kuyper and C. Dennison (1982). The relationship between tannic acid content and metabolizable energy concentration of some sorghum cultivars. *S. Afr. J. Anim. Sci.*, 12:39.

Jakobsen, P.E.; S.G. Kirsten and H. Niclsen (1960). Fredjelighed frogmed fierbrae"Digestibility trails with poultry". Bereting fra for sogslabortoriat , Kabenhaven, 56:1-34.

Makkar, H.P.S.(1993). Antinutintional factors in foods for livestock. Animal production in developing.countries. *Brit.Society Anim. Prod.*, 16:69-85.

Martin , A. L.; A. Moumen; D. R. Yanez Ruiz and E. Molina Alkaid (2003). Chemical composition and nutrients availability for goats and sheep of two stage olive cake and olive leaves. *Anim., Sci. and Tech.*, 107:61- 74.

Morgan, D.E. and H. Trinder (1980). The composition and nutritive value of some tropical and sub-tropical by-products. *Brt. Soci.of Anim. Prod.*, 3:91.

Nefzaui, A.(1985). In "*The olive cakes in olive tree by-products*". The development of Integrated Crop/Livestock production in the Low Rainfall Areas of West Asia and North Africa. (Mashreq/ Maghreb Project). Sep., 1997. 23-24.

NRC., National Research Council (1994). In "*Nutrient Requirements of Poultry*". 9th Revised ed. National Academy Press, Washington, D.C.

Razzaque, M.A. and F. O. El-Sheikh (1980). Olive oil cake in the rations of growing heifers. *Libyan J. Agric*., 10:25-30.

Reed, J.D.; H. Soller and A. Woodward (1990). Fodder tree and straw diets for sheep: intake, growth, digestibility and the effects of phenolics on nitrogen utilization. Anim. *Feed Sci. and Tech.*, 30: 39-50.

Robbins, C.T.; T.A. Hanely; A.E. Hagerman; O. Hjeljord; D.L. Baker; C.C. Schwarty and W. Mauty (1987). Role of tannins in defending plants against ruminants: reduction in protein availability. *Ecology*, 68: 98-107.

Samia M. Hashish and Laila D. Abd El-Samee (2002).The partial inclusion of olive cake and barley radicle in laying hen diets: responses in nutrient digestibility, productive performance and egg quality. *Egypt. Poult. Sci.*, 22(4): 983-999.

SAS (1996). In" *Statistical analysis system*" User's Guide SAS institute. Inc., Cary, North Carolina. USA.

Streeter, M.N.; G.M. Hill; D.G. Wagner; F.N. Owens and C.A. Hibberd (1993). Effect of bird resistant and non bird resistant sorghum gain on amino acid digestion by beef heifers. *J. Anim. Sci.*, 71: 1648-1656.

Strong, C.F.; J. N. E. Nestor and W. L. Bacon (1977). Inheritance of egg production, egg weight, body weight and certain plasma constituents in coturnix. *Poult. Sci.*, 57:1-9.

Titus,H.W. (1961).In "*The scientific feeding of chickens*". Danville, Illinois, USA.

Tortuero, F.; J. Rioperez and M.L Rodiguez (1989). Nutritional value for rabbits of olive pulp and the effects on their visceral organs. *Anim. Feed Sci. and Tech.*, 25: 79-87.

Received: 25/01/2006
Accepted: 14/03/2007

الاستفادة من كسب الزيتون في علائق السمان الياباني البياض

خالد عبد الجليل – هبه أبو العز* – هنده عبد الجليل محمود
قسم تغذية الحيوان والدواجن – مركز بحوث الصحراء – المطرية– القاهرة– مصر.
*قسم علم الحيوان – كلية العلوم – جامعة القاهرة– الجيزه– مصر.

استخدم في هذا البحث عدد ١٢٠ سمان ياباني عمر ٤ أسابيع وحتى عمر ٢٢ أسبوع. حيث كان الهدف من التجربة دراسة الاستفادة من كسب الزيتون في علائق السمان الياباني البياض. قسمت الإناث (٨٠ أنثى) إلى أربع مجموعات تجريبية متساويات. اشتملت كل مجموعة على ٢٠ أنثى سمان (١٠ مكررات بكل منها ٢ سمان) بينما قسمت الذكور (٤٠ ذكر) إلى أربع مجاميع متساوية (كل ذكر فردى).تم تغذية الطيور حتى حد الشبع على نسب متدرجة من كسب الزيتون ٠ , ١٠ , ١٥ و٢٠% من مكونات العليقة. العلائق المستخدمة متشابهة في نسبة البروتين الخام ٢٠% والطاقة الممثلة ٢٩٠٠ كيلو كالورى /كيلوجرام. عند عمر ١٥ أسبوعا نقلت الذكور إلى أقفاص الإناث بنسبة تناسلية ٢ أنثى :١ ذكر لمدة ٢٠ دقيقة يوميا لمدة خمسة أيام لتقدير نسبة الفقس.يمكن إيجاز أهم النتائج في النقاط التالية:

١ – سجلت المعاملة التي تم تغذية الطيور بها على ١٠ % من كسب الزيتون تحسنا معنويا (عند المستوى ٥ %) في كل من وزن الجسم والتغير في وزن الجسم ,بينما سجلت المجموعة ٢٠ % اكثر القيم انخفاضا مقارنة بالمعاملات الأخرى.

٢ – لم يسجّل وزن البيضة الأولى والعمر عند النضج الجنسي فروقا معنوية بين المجموعات التجريبية.

٣– سجل وزن وعدد وكتلة البيض اختلاف معنويا (عند مستوى ٥%) بين المجموعات التجريبية خلال فترة التجربة.

٣ – لوحظ زيادة معدل استهلاك الغذاء معنوياً (عند مستوى ٥%) وذلك بزيادة نسبة إضافة كسب الزيتون في العليقة. وقد سجلت المعاملة المغذاة على ٢٠ % اكبر تلك القيم استهلاكا للغذاء. بينما سجلت مجموعة المقارنة اقل القيم خلال فترة التجربة.

٤ – سجلت المجموعة المغذاة على مستوى ١٠ % افضل معدل تحويل غذائي (جم غذاء مستهلك/ جم كتلة البيض) مقارنة بمستوى الإضافة ١٥% و٢٠%, حيث سجلت المجموعة ٢٠ % أسوأ معدل تحويل غذائي مقارنة بالمجموعات التجريبية خلال فترة التجربة.

٥ – سجّلت النسبة المئويّة للبياض ودليل الصفار انخفاض معنويا (عند مستوى ٥ %) بينما سجلت النسبة المئوية للصفار وسمك قشرة البيضة زيادة غير معنوية بزيادة مستويات الإضافة لكسب الزيتون في العليقة.

٦ – حدث تغير معنوي (عند مستوى ٥ %) في شكل البيضة وذلك بزيادة نسبة كسب الزيتون في العليقة.

٧– أظهرت معاملات الهضم الظاهرية لكل من البروتين الخام والألياف الخام انخفاضا معنويا (عند مستوى ١ %) وكان الانخفاض معنوياً (عند مستوى ٥ %) لمعاملات هضم المادة العضوية والمستخلص الخالي من النيتروجين بينما ارتفع معامل هضم مستخلص الأثير ارتفاعا معنويا (عند مستوى ٥ %) بزيادة مستويات الإضافة لكسب الزيتون في العليقة.

٨ – تم استنتاج معادلات خط الانحدار التي تمثل العلاقة بين نسبة إضافة كسب الزيتون وعدد وكتلة البيض واستهلاك الغذاء ومعدل التحويل الغذائي.

٩– حققت المجموعة المغذاة على ١٠ % كسب الزيتون أفضل عائد صافي بالإضافة إلى افضل كفاءة اقتصادية مقارنة بباقي المعاملات.

من الوجهة الغذائية والاقتصادية توصى الدراسة بإمكانية استخدام كسب الزيتون في علائق السمان البياض حتى مستوى ١٠ % دون تأثير سلبي على معدلات أداء الإنتاج والعائد الاقتصادي.