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UTILIZATION OF OLIVE PULP MEAL AS A FEEDSTUFF IN GROWING JAPANESE QUAIL DIETS

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ABSTRACT

A total number of 180 Japanese quail chicks at hatch were used in an experiment which lasted 6 weeks. The experiment aimed to study the utilization of olive pulp meal (OPM) as a feedstuff in growing Japanese quail diets. Chicks were divided into 4 equal experimental groups of 45 chicks in three replicates (15 chicks/ replica.). The OPM was used at levels of 0,10,15 or 20% in the diets. The experimental diets were isocaloric and isonitrogenous

Live body weight and body weight gain of quail chicks were significantly (P< 0.05) decreased with the increase of OPM % in the diets. The highest live body weight and body weight gain were recorded by using 10 % OPM, while, those fed on 20 % recorded the lowest one. It is worthy noting that feed intake increased significantly (P<0.05) with the increasing of OPM levels. Moreover, feed conversion ratio (g feed/g gain) became significantly worst (P< 0.05) by increasing DSM up to 20% in the diets.

The highly levels of OPM in the diets showed significant (P< 0.05) decrease in the dressing percentage of quail. The 10 % OPM group showed the best net return as well as the highest value of economic efficiency among experimental groups.

Digestibility coefficients of CP, CF, NFE and the nutritive values as DCP ,TDN % and ME(Kcal/kg) were significantly varied (P<0.05 or P<0.01) among the different experimental groups.

Serum TP, AL ,GL, A/G ratio, Cr and Ur recorded a non-significant difference among quail groups. Serum enzymes ALT, AST recorded an increase (p<0.05) with increasing OPM levels.Serum cholesterol recorded decrease (p<0.05) with increasing OPM levels.

From the nutritional and economical efficiency stand points of view, the olive pulp meal could be recommended to be used successfully and safely in formulated diets for growing quail, if be included up to 10% without adverse effect on growth performance or physiological parameters.

Keywords: Quail, olive pulp meal, growth performance , Digestion trials, carcass traits, economic efficiency and some physiological parameters

INTRODUCTION

The waste residues of fruit and vegetable after harvesting and processing are used as sources of protein and energy in feeding poultry. Recently, the application of non-conventional feedstuffs to poultry nutrition in developing countries has received considerable attention. With increasing feed cost of poultry, nutrition are forced to look closely at agricultural by-products, which cost less than conventional feedstuffs.At the same time, there are large quantities of untraditional inexpensive feed resources and agricultural by-products available such as olive pulp meal (OPM) in the newly reclaimed areas, and it can be used in quail chicks feeding as a particle substitute for the conventional feed stuffs, as a cheap untraditional feedstuffs.

The amount and nature of olive by-products vary greatly according to the technology used to extract oil. 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 are glutamic and aspartic acids and it is limited in lysine, histidine and methionine. It also contains moderate amounts of arginine. Morgan and Tinder (1980) reported that olive ,pulp appeared to be a good source of Cu, Ca and Co and lower in P, Mg and Na. Razzaqua *et al.* (1980) reported that olive pulp is fairly rich in essential elements and minerals especially K, Cu, Mn and Zn. There are some researches on its use in rabbit diets (Ghazalah and El-Shahat, 1994, EL-Kerdawy, 1997 and Abd El- Galil, 2001), in broiler chicks (Ahmed 1998, Abd El- Maksoud 2001and Attia et al., 2001).There is no available data on the use of OPM in diets of growing quail.

The main objective of the present work was to evaluate olive pulp meal and study its effect on growth performance, economic efficiency, carcass traits and some physiological parameters of growing quail.

MATERIALS AND METHODS

The present work was carried out at Maryiout Experimental Research Station (South West of Alexandria) which belongs to the Desert Research Center. The experiment aimed to study the utilization of olive pulp meal (OPM) as a non conventional feedstuff in growing Japanese quail diets .

At the beginning of the experiment, two digestion trials were carried out in order to evaluate the digestion coefficient of nutrients and determined the metabolizable energy (ME Kcal/kg) values for olive pulp meal (OPM), using 8 mature quail males (4 in each trials). In the 1^{st} trial, the ME of yellow corn (YC) was determined directly. In the 2^{nd} trial, ME value of OPM (as tested material) was determined indirectly using YC as a basal diet at ratio 1:1 (YC: tested material). A basal diet was formulated from 96 % Yellow corn, 1.11 % Limestone, 1.06 % Dicalcium phosphate, 0.33 % Methionine, 1.05 % Lysine, 0.20% Premix (Vit. and Min.) and 0.25 % salt . Metabolizable energy was calculated according to the equation of Titus and Fritz (1971).

A total number of 180 Japanese quail (Coturnix Coturnix japanica) chicks at hatch were used and kept under similar managerial , hygienic and environmental conditions. The chicks were housed in cages at hatch up to 42 days of age.

Quail Chicks were divided randomly into 4 equal experimental groups of 45 chicks in three replicates (15 chicks / replica.). The first group was fed the basal diet as a control, while, the other three groups were fed diets containing either 10,15 or 20 % OPM.

The experimental diets (Table 1) were formulated according to N.R.C. (1994) and were isocaloric and isonitrogenous. Feed and water were offered *ad libitum* .Chemical analysis of DSM , the experimental diets , meat and feces were assayed using methods of A.O.A.C (1990). Live body weight (LBW) and feed intake (FI) were determined biweekly. Body weight gain (BWG) and feed conversion ratio (g feed/g gain) were calculated. Mortality rate was also recorded .

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

Ingredient %	Control	Levels of olive pulp meal		
		10%	15%	20%
Olive Pulp meal	0.00	10.00	15.00	20.00
Soybean meal (44%)	11.30	12.16	10.72	11.90
Yellow corn	56.00	50.00	46.84	44.23
Concentrate * (52%)	10.00	10.00	10.00	10.00
Corn gluten meal (60%)	11.84	12.00	13.00	12.40
Wheat bran	9.53	4.44	3.00	0.00
Dicalcium phosphate	0.44	0.50	0.50	0.51
Vit.and min. mix.**	0.30	0.30	0.30	0.30
L- lysine	0.38	0.38	0.41	0.41
Dl- methionine	0.21	0.22	0.23	0.25
Total	100	100	100	100
Proximate chemical analysis %				
Crude protein (CP)	24.10	24.02	23.97	23.89
Crude fiber (CF)	3.45	4.55	4.98	5.64
Ether extract (EE)	3.68	4.18	4.60	5.11
Calculated values :				
Metabolizable energy (Kcal/kg)***	2900	2903	2906	2906
Calcium %	0.86	0.88	0.88	0.89
Available phosphorus %	0.30	0.30	0.30	0.30
Methionine %	0.52	0.52	0.52	0.51
Lysine %	1.30	1.30	1.30	1.30
Methionine +Cystine %	0.75	0.75	0.75	0.75
Price /Kg diet (L.E)****	1.46	1.37	1.33	1.30

* Protein concentrate contain, 52%Crude protein, 2.03% Crude fiber, 6.17%Ether extract, ME 2080 (Kcal/Kg) ,1.50 % Methionine,2.00% Methionine & Cystine , 3.0 %Lysine 7.00% Calcium , 2.93 % Avalailable Phosphorus 2,20 % Nacl .

**Each 1 kg Vitamins and minerals contain : Vit. A 120000 IU, Vit. D_3 22000 IU, Vit.E100 mg, Vit.K_3 20mg, Vit. B_1 10 mg, Vit. B_2 50mg, Vit. B_6 15 mg, Vit.B_{12} 100 µg, Pantothenic acide 100 mg,Niacin 300 mg, Folic acid 10mg, Biotin 500 µg, iron 300mg, Manganese 600 mg, Choline chloride 500 mg, Iodine 10 mg ,Copper 100 mg, Seleneium 1 mg, Zinc 500 mg and 1200 mg Anti-oxidant

*** Calculated according to NRC of poultry (1994) and determined according to the digestion trials of OPM.

****Calculated according to price of feed ingredient 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 males quail (five from each treatment) to determine the digestibility coefficients of the experimental diets as afffected by OPM levels. Birds were housed individually in metabolic cages. The digestibility trials extended for 9 days; 5 days as a preliminary period 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 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). Metabolizable energy was calculated according to the equation of Titus and Fritz (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 economical efficiency of feed was calculated from the input-output analysis based on the differences in feed conversion ratio and feeding cost.

Ten birds from each treatment were chosen randomly for slaughter test. Dressing percentage was calculated as carcass weight divided by the pre-slaughter weight. Carcass parts were weighed and calculated as a percentage of live body weight, blood samples were collected from birds.

The assays of serum total protein (TP) and albumin (AL) were carried out by a test kit supplied by Biomerieux company according to the method of *Weichselbaum* (1946). *Dounces et al.* (1971),respectively. Serum globulin (GL) was calculated by subtracting the obtained value of albumin from total serum protein.Serum aspartate aminotransferase (AST) and alanine amino-transferase (ALT) activities were determined by a kit purchased from Biomerieux company according to the method of *Reitman and Frankel* (1957).Serum creatinine(Cr) was determined by a kit supplied by Boehringer Mannheim according to *Jaffe* (1986). Serum uric acid (Ur) was determined by a kit supplied by El-Nasr Pharmaceutical company according to *Caraway* (1963). Data were statistically analyzed according to *SAS* (1996) using simple one-way classification. All data percentages were transformed to their arc-sin values before analysis and differences among treatment means were determined by Duncan's New Multiple Range Test (*Duncan*, 1955). Regression equation analysis of feed intake, feed conversion ratio and digestion coefficients were undertaken to clarify the relation between these parameters and OPM content in the experimental diets

RESULTS AND DISCUSSION

Chemical analysis, digestibility and nutritive values of olive pulp meal.

The proximate chemical analysis of OPM indicated that CP% content was 9.24 %, while, values for CF, EE ,NFE and ash % were 18.45 , 9.71, 42.58 and 7.54%, respectively. These results were nearly similar to those of Ghazalah and El-Shahat (1994) recording 9.31% and 18.02%. for CP and CF, respectively. Ahmed (1998) reported that CP, CF ,EE and NFE% of OPM were 7.0, 19.80, 9.04 and 41.15%, respectively, while, Abed El-Maksoud,(2001) reported that CP, CF, EE and NFE % of OPM were 9.67, 27.66, 8.98 and 33.24%, respectively, This variation in the chemical composition may be due to the type of the fruit, degree of maturity and extraction methods. Apparent of digestion coefficients % in the indirect digestion trials of OPM were 69.14 , 70.03, 16.75, 81.89 and 77.21 % for OM, CP, CF, EE and NFE%, respectively. The nutritive values of OPM expressed as DCP, TDN % and ME (Kcal/kg) were 6.47, 60.32 and 2451 Kcal/kg, respectively. Similar results were obtained by Ahmed (1998) who showed that digestibility coefficient of OM, CP, CF, EE and NFE were 64.05, 78.53, 19.73, 81.91 and 79.66 %, respectively, while, The nutritive values of DCP , TDN% and ME(Kcal/kg) were 5.50, 58.89 and 2463 Kcal/kg, respectively, by broiler chicks.The feeding quality of olive pulp seemed to depend on the method of production (expressed or extracted, the presence or absence of pits and elapsed time and treatment of pulp between pressing and processing (Belibasakis 1985).

Live body weight and body weight gain .

The effect of feeding quail with different levels of OPM on live body weigh and body weight gain during the experimental period (6 weeks of age) are summarized in Table 2. Live body weight was significantly vaired ($P<0.05$) among the different experimental groups. It is worthy that live body weight at all age was improved with increasing the OPM level in the diet at 10% and it is gradually decreased with elevating it up to 20 %.

Body weight gain during the whole experimental period recorded a significant difference ($P<0.05$) among groups .It was observed that the 10% OPM group was nearly similar to the control one..It was observed that the 10% OPM group was nearly similar to the control one. It is worthy noting that feeding quail on 10 % OPM resulted in 1.25 % higher in body weight gain than that of control group. while, increase the OPM level to 20 % resulted in 6.31 % and 5.14 % lower than that of 10 % and control group, respectively. These results agreed with those of Al- Shanti *et al.* (2003[a]) who found a significant increase in body weight gain for growing chicks fed 10 % OPM. However, Attia *et al.*,(2001) who reported that body weight gain of broiler chicks recorded no significant increase after feeding diets containing OPM till 16% .

Feed intake and feed conversion ratio.

Feed intake (FI) during the whole, experimental period recorded an increase ($P< 0.05$) with the increase of OPM levels as shown in Table 2. A non significant increase was observed in quail fed 10% or 15% OPM versus control group. Moreover, a significant increase was found in the FI of the group fed 20% OPM versus control, It is clear that substitution of diet by 20 % OPM increased feed intake by 3.55 % higher than that of the control group.

Regarding the amount of feed intake (g/period) by the experimental quail, it is observed that feed intake increased with increasing OPM levels.

Regression equations were obtained for FI were as a function of their OPM content .These relationships were defined by the following regressions:

$$FI = 681.24+1.19\,X$$

$$r^2 = 0.93, \quad (p<0.05).$$

Where: X = levels of olive pulp meal (OPM) .

This increase in FI may be due to the improvement of the palatability and increased of crude fiber on diets. These results are in agreement with those of Attia *et al.*.(2001) who obtained significant ($P<0.01$) increase in FI using different levels of OPM in the diet of broiler chicks. Abd El- Galil (2001) who found increase ($P< 0.05$) in FI of rabbits with increasing OPM levels of rabbits fed from 5 up to 20 % OPM.

Table 2: Effect of feeding different levels of olive pulp meal on growth performance (Mean ±SE) of quail.

Criteria	Control	Levels of olive pulp meal			Sig.
		10 %	15 %	20 %	
Live body weight (g).					
Initial	8.39±0.48	8.42±0.35	8.40±0.25	8.43±0.57	ns
2 weeks	51.79±0.78^{a}	52.61±1.14^{a}	49.62±1.29^{ab}	47.67±2.56^{b}	*
4 weeks	110.47±1.2^{a}	112.47±1.30^{a}	107.99±2.01^{ab}	104.56±3.90^{b}	*
6 weeks	182.21± 1.5^{a}	184.41±1.77^{a}	178.25±2.44^{ab}	173.32±2.12^{b}	*
Weight gain (g)/bird /period .					
0-2 weeks	43.4±0.05^{a}	44.19±0.81^{a}	41.22±1.20^{ab}	39.24±1.14^{b}	*
2-4 weeks	58.68±0.77^{a}	59.86±0.38^{a}	58.37±1.32^{ab}	56.89±0.94^{b}	*
4-6 weeks	71.74±0.95^{a}	71.94±0.53^{a}	70.26±1.40^{ab}	68.76±1.36^{b}	*
0-6 weeks	173.82±1.12^{a}	175.99±1.49^{a}	169.85±2.40^{ab}	164.89±1.98^{b}	*
Feed intake (g)/ bird /period.					
0-2 weeks	120.92±1.20^{b}	122.49±2.19^{b}	125.13±1.85^{ab}	128.61±2.42^{a}	*
2-4 weeks	232.35±1.08^{b}	236.43±2.5^{ab}	239.23±2.25^{ab}	241.82±3.01^{a}	**
4-6 weeks	329.84±1.63^{b}	330.96±2.0^{ab}	333.7±2.21^{a}	334.86±1.67^{a}	*
0-6 weeks	683.11±3.28^{b}	689.88±2.4^{ab}	698.08±3.45^{ab}	707.38±3.88^{a}	*
Feed conversion ration.					
0-2 weeks	2.79±0.03^{b}	2.77±0.04^{b}	3.04±0.05^{ab}	3.28±0.04^{a}	*
2-4 weeks	3.96±0.05^{b}	3.95±0.01^{b}	4.10±0.08^{ab}	4.25±0.05^{a}	*
4-6 weeks	4.60±0.05^{b}	4.60±0.02^{b}	4.75±0.09^{ab}	4.87±0.10^{a}	*
0-6 weeks	3.93±0.03^{b}	3.92±0.05^{b}	4.11±0.06^{a}	4.29±0.05^{a}	*
Morality rate %.					
0-6 weeks	3.97±048	4.12±0.32	3.99±0.41	5.1±0.45	ns

a,b: Means within a row with different superscripts are significantly different (P< 0.05).
Sig.= Significance , *= (P< 0.05), **= (P< 0.01) , n.s = not significant

Feed conversion ratio (FCR) revealed a significant difference (P<0.05) among the experimental groups. On the basis of the present data, it seems that quail received diets supplemented with 15 and 20 % OPM were to some extent less in feed conversion compared to the other groups.The reduction observed in FCR may result from the decreased body weight gain and increased feed intake as a result of OPM levels in the diets.

Regression equations were obtained for FCR were as a function of their OPM content. These relationships were defined by the following regressions:

$$FCR = 3.87 + 0.02\,X$$

$$r^2 = 0.73,\ (p<0.01).$$

Where: X = levels of olive pulp meal (OPM).

Similar results were recorded by Al- Shanti *et al.*(2003[a]) who reported an improvement in FCR of chicks fed diets incorporated with 10% OPM. Abd El-Galil (2001) found that FCR of rabbits decreased with increasing levels of OPM from 5 up to 20% OPM.

Mortality rate %.

Results on mortality rate % recorded a non significant difference among groups (Table 2). However, quail fed control diet recorded the lowest value, while, the 20% OPM level recorded the highest mortality rate.

Carcass traits and chemical analysis of meat.

Results on carcass traits and chemical analysis of quail meat are listed in Table 3. Results showed that, in the diet containing the highest level of OPM decreased significantly (P<0.05) the dressing percentage , while, 10% OPM Resulted the higher value than all groups. The decrease in dressing percentage was due to the decrease in live body weight.

Chemical analysis of meat did not show significant difference among experimental groups in moisture, protein and Ash. On the other hand, ether extract (EE)% value recorded a significant difference (P<0.05) among the experimental diets, where a gradual increase was noticed in EE% with increasing OPM levels.This result agreed with those of El-Kerdawy (1997)and Abd El- Galil (2001) who observed no significant differences in carcass percentage and Chemical compostion of meat with 15 or 20 % OPM, respectively, of rabbits diet

Table 3: Carcass traits and chemical analysis of meat (Mean ±SE) of quail as affected by feeding different levels of olive pulp meal .

Criteria	Control	Levels of Olive Pulp meal			Sig
		10 %	15 %	20 %	
Live bod yweight(g)	183.50 ± 1.22^{a}	185.91 ± 1.26^{a}	181.15 ± 1.18^{ab}	179.33 ± 2.4^{b}	*
Dressing %	72.86 ± 0.03^{ab}	73.09 ± 0.09^{a}	71.67 ± 0.41^{c}	70.55 ± 0.49^{b}	*
Heart %	0.75±0.02	0.82±0.12	0.83±0.1	0.85±0.1	ns
Gizzard %	2.39±0.03	2.75±0.04	2.80±0.04	2.90±0.4	ns
Liver %	2.47±0.02	2.61±0.12	2.72±0.08	2.81±0.14	ns
*Edible giblets %	5.61±1.10	6.18 ± 1.29	6.35±1.43	6.56±1.45	ns
Moisture %	72.25± 0.39	72.17±0.49	72.12±0.50	72.01± 0.54	ns
Protein %	22.21± 1.05	22.12± 1.41	22.08± 1.68	21.70± 1.07	ns
Ether extract %	3.06 ± 0.60^{b}	3.27 ± 0.8^{ab}	3.34 ± 0.12^{ab}	3.45 ± 0.16^{a}	*
Ash %	1.33± 0.50	1.34± 0.55	1.36± 0.56	1.39± 0.6	ns

a,b: Means within a row with different superscripts are significantly different (P< 0.05).
Sig= Significance, * (P< 0.05), ns= not significant .
- **Edible giblets = liver, heart and grizzard weights.**

Digestibility and nutritive values of the experimental diets.

The digestion coefficients for levels of OPM as compared with control diet are present in Table 4 and Fig 1. Results indicated a highly significant (P<0.01) decrease occurred in crude protein (CP%) and crude fiber (CF%). Digestibility of EE % value showed a non significant increase by the incorporation of 10% OPM versus control diet, while, a significant increase (P<0.05) was recorded by 15% and 20% OPM levels. Nitrogen free extract (NFE%) was gradually decreased (P<0.05) by elevating the OPM level in the diet from 0.0 up to 20%. Similar results were obtained by Abd El-Maksud (2001) who reported that increasing OPM up till 12 % in the diet of broiler chicks decreased significantly the digestion coefficient of OM ,CP, CF and EE. Abd El- Galil (2001) found this reduction (P<0.01) in digestibility of CF% and CP% when fed OPM in rabbit diets.

Regarding the nutritive values, it is clear that DCP,TDN% and ME (Kcal/kg) were decreased significantly (P<0.01 or P<0.05) by increasing OPM more than 15% in the diet. The observed decrease in nutritive values which followed the increase in OPM inclusion be attributed to the depression in digestibility of OPM. These results agreed with those of Abd El- Galil (2001) who found that nutritive values of rabbits decreased with increasing levels of OPM from 5 up to 20% OPM.

Table 4: Effect of feeding different levels of olive pulp meal (OPM) on digestibility coefficients % (Mean ±SE) of experimental diets .

Items	levels of olive pulp meal				Sig
	control	10%	15%	20%	
Digestion coefficients					
CP	82.51±1.2^{a}	80.86±1.38^{ab}	77.85±2.45^{ab}	75.05±2.7^{b}	**
CF	25.53±1.4^{a}	22.19±1.41^{ab}	18.90±1.63^{b}	16.94±2.0^{b}	**
EE	84.11±1.82^{b}	85.98±0.82^{b}	87.79±0.42^{a}	86.53±0.8^{a}	*
NFE	85.62±1.1^{a}	84.95±0.40^{ab}	84.19±0.33^{ab}	83.91±1.2^{b}	*
Nutritive values					
DCP%	19.88±0.3^{a}	19.42± 0.42^{a}	18.66 ±0.3^{ab}	17.92±0.5^{b}	**
TDN%	67.85 ±1.2^{a}	66.44 ±2.01^{a}	65.05±1.5^{ab}	64.18 ±1.6^{b}	*
ME (Kcal/kg)	2872±98.2^{a}	2811±99.1^{ab}	2750±88.57^{b}	2710±99.8^{b}	*

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

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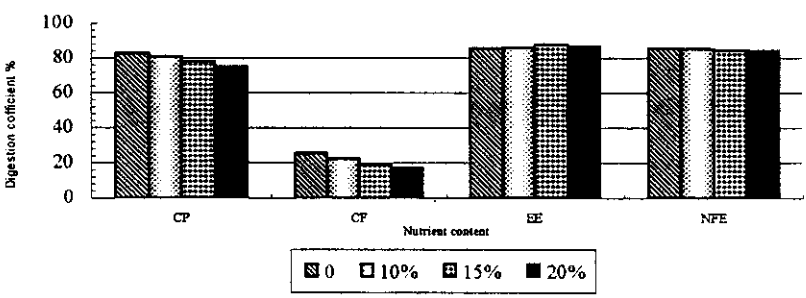


The decrease in digestibility of CP and CF may be to attributed to lignin content of OPM and the fact that most of its total nitrogen is linked to ligncellulose, two main factors which limiting the digestive utilization of olive residues (Aguilera 1987) and probably caused by the presence of tannins, which may adversely affect the nutrition of herbivores through inhibition of digestion as suggested by *Robbins et al.* (1987). These results were supported with *Reed et al.* (1990) who reported that tannins 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 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). *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.

Regression equations of digestion coefficients as affected by the different levels of OPM are shown in Table 5. These regression equations were obtained for digestibility of CP, CF, EE and NFE in the diets were as a function of their OPM content .

Table 5 : Regression equations of digestion coefficients as affected by feeding OPM diets

Items	Regression equations	r^2	P
CP	85.14-0.45 X	0.94	**
CF	25.76 –0.45 X	0.97	**
EE	84.43+0.13 X	0.60	*
NFE	85.91- 0.12 X	0.78	*

* = (P< 0.05), ** = (P< 0.01) X = Levels of OPM.

It is of great importance to noting that the results of the digestibility and feeding values of experimental diets were coincided generally with the differences in growth performance and feed utilization in quail fed OPM.

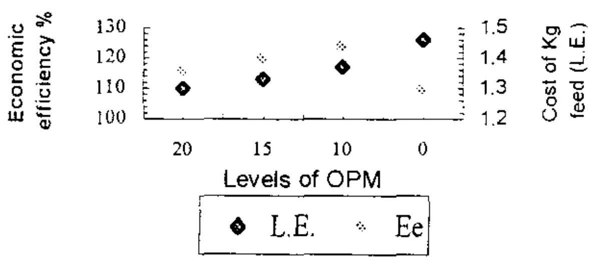
Economic efficiency.

Results indicated that cost of kg feed (L.E) decreased gradually with increasing the levels of OPM. However, net return and economic efficiency of experimental diets increased versus control diets.

The present results indicated that the 10% OPM is the best level in feeding growing quail as it produced the highest net return and highest economic efficiency, as shown in Table 6 and Fig 2 .

Table 6: Effect of different levels of olive pulp meal on the economic efficiency by growing quail.

Criteria	Control	Levels of olive pulp meal		
		10%	15%	20%
Feed conversion ratio	3.93	3.92	4.11	4.29
Cost of Kg feed (L.E)	1.46	1.37	1.33	1.30
Feed cost of kg meat (L.E)	5.74	5.37	5.47	5.59
Market price of one Kg meat (L.E)	12.00	12.00	12.00	12.00
Net return (L.E)	6.26	6.63	6.53	6.42
Economic efficiency % (Ee) of feed	109.06	123.46	119.38	115.05
Relative economic efficiency of feed	100	112.65	108.92	104.97



Biochemical parameters.

Serum, total protein (TP), albumin (AL), globulin (GL), A/G ratio, creatinine (Cr) and uric acid (Ur) were not significantly different between quail groups.(Table 7). Similar results were noticed by Al-Shanti (2003[b]) who reported that different levels of OPM up to 20% level showed no effected on TP of rabbits. El-Kerdawy (1997) reported that serum Cr of growing rabbits were not significant affect on rabbits fed up to 20% OPM.

Table 7: Some biochemical parameters in serum (Mean ±SE) of growing quail fed different levels of olive pulp meal .

Criteria	Control	10%	15%	20%	Sig.
TP (g/100 ml)	3.59 ± 0.06	3.85±0.08	3.69±0.13	3.73±0.2	n.s
Albumin (g/100 ml)	1.65±0.05	1.65±0.19	1.71±0.18	1.74±0.21	n.s
Globulin (g/100 ml)	1.94±0.03	1.93±0.2	1.98±0.16	1.99±0.19	n.s
A/G ratio	0.85±0.015	0.85±0.11	0.86±0.16	0.87±0.21	n.s
AST(u/ml)	29.33±1.04^{b}	31.35±0.89^{ab}	32.95±1.18^{a}	34.48±1.13^{a}	*
ALT (u/ml)	7.33±0.91^{b}	8.07±0.63^{b}	9.91±1.16^{ab}	10.01±0.93^{a}	*
Creatimine (mg/100 ml)	0.85±0.02	0.86±0.03	0.84±0.12	0.81±0.09	n.s
Uric acid (mg/100 ml)	1.55±0.05	1.67±0.03	1.57±0.09	1.63±0.09	n.s
Cholesterol (mg/100 ml)	175.25±2.19^{a}	176.32±1.22^{a}	173.79±1.23^{ab}	170.01±1.63^{b}	*

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

Serum liver enzymes ALT and AST recorded a gradual increase ($p<0.05$) with increasing OPM level. The increase in serum AST and ALT may be due to the presence of phenolic compounds which produce adverse effects on liver functions. Abu daya (1990) reported that most of the pure phenolic compounds extracted from olive cake had harmful effects on liver and kidney functions, haemoglobin, carbohydrate and lipid metabolism. Abd El-Samee *et al.* (2003) noticed a significant increase in serum ALT of rabbits fed 20% OPM. From the obtained results, it is clear that the 10 % OPM was the best level that could be used in feeding quail without any adverse effects on liver functions. serum cholesterol was observed a gradual decrease ($p<0.05$) with increasing OPM level.

This decrease in serum cholesterol may be due to the predominance of unsaturated fatty acids in OPM.(Table 7). El-Kerdawy (1997) reported that rabbits fed diets including 10 or 15 % OPM suffered from a significant decrease in serum cholesterol. Marzouk *et al.* (1986) reported that most of fatty acids present in olive oil are unsaturated.Al- Shanti (2003[a]) noticed a reduction in total serum cholesterol of broiler chicks fed diets containing 5 and 10% OPM.

Conclusion, from the nutritional and economical efficiency stand points of view, the olive pulp meal could be recommended to be used successfully and safely in formulated diets for growing quail, if be included up to 10% without adverse effecting on growth performance or physiological parameters.

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الاستفادة من كسب الزيتون كمادة غذائية في علائق السمان الياباني النامي

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استخدم في هذا البحث عدد ١٨٠ كتكوت سمان ياباني من الفقس و حتى عمر ٦ أسابيع. حيث هدفت التجربة إلى دراسة الاستفادة من كسب الزيتون كمادة غذائية فى علائق السمان اليابانى النامي. قسمت الكتاكيت إلى أربع معاملات تجريبية متساوية. اشتملت كل معاملة على ٤٥ كتكوت سمان (٣ مكررات بكل منها ١٥ كتكوت). غذيت الكتاكيت النامية حتى حد الشبع على نسب متدرجة من كسب الزيتون ١٠، ١٥ و ٢٠ % من مكونات العليقة . العلائق المستخدمة متشابهة في نسبة البروتين الخام ٢٤% والطاقة الممثلة ٢٩٠٠ كيلو كالورى /كيلوجرام

- أظهرت النتائج أن كسب الزيتون يحتوى على نسبة مرتفعة من الألياف ١٨,٤٥% . بينما ينخفض المحتوى من البروتين ٩,٢٤ % .والطاقة الممثلة ٢٤٥١ كيلو كالورى/كيلو جرام عليقة
- سجلت المعاملة التي غذيت على ١٠ % من كسب الزيتون تحسنا معنويا (عند المستوى ٥ %) فى كل من وزن الجسم ومعدل النمو مقارنة بباقي معاملات الإضافة.
- لوحظ ارتفاع معدل استهلاك الغذاء خلال فترة التجربة ارتفاعا معنويا (عند مستوى ٥%) وذلك بزيادة نسبة إضافة كسب الزيتون في العليقه . وقد سجلت المعاملة المغذاة على ٢٠ % اكبر تلك القيم . بينما سجلت مجموعة المقارنة اقل القيم خلال فترة التجربة .
- لم يكن هنالك تأثير معنوي لمستويات الإضافة لكسب الزيتون على صفات الذبيحة حتى المستوى ١٥ % ،بينما سجلت المعاملة ٢٠ % انخفاضا معنويا (عند مستوى ٥ %).
- تحقق أعلى عائد اقتصادي عند مستوى ١٠ % خلال فترة التجربة مقارنة بباقي مستويات الإضافة في العليقة .
- أظهرت معاملات الهضم الظاهرية لكلامن البروتين والألياف الخام انخفاضا معنويا (عند مستوى ١ %) بينما انخفض معنويا (عند مستوى ٥ %) معاملات هضم المادة الجافة للمستخلص الخالي من النتروجين و لم تتأثر معاملات هضم مستخلص الأثير بمستويات الإضافة لكسب الزيتون في العليقة.
- وقد تم استنتاج معادلات خط الانحدار التي تمثل العلاقة بين نسبة إضافة كسب الزيتون و استهلاك الغذاء ومعدل التحويل الغذائي و معاملات الهضم الظاهرية للعليقة

لم يكن هنالك تأثيرا معنويا على محتوى السيرم من البروتين الكلى والالبيومين و الجلوبيولين والكرياتين وحمض اليوريك .

- زاد نشاط انزيم AST, ALT بدرجة معنوية (عند المستوى ٥ %) لنسب الإضافة ٢٠، ١٥ % في العليقة.
- تأثر مستوى السيرم من الكوليسترول تأثيرا معنويا (عند المستوى ٥ %) مع زيادة نسبة الإضافة إلى ٢٠ % بينما كانت الزيادة غير معنوية لمستوى ١٠، ١٥% .

يمكن التوصية من الوجهة الغذائية ، الفسيولوجيه والاقتصادية إمكانية استخدام كسب الزيتون في علائق السمان النامي حتى مستوى ١٠ % دون تأثير سلبي على معدلات أداء النمو و العائد الاقتصادي والقياسات الفسيولوجية .