Egypt.Poult. Sci.Vol(37)(IV): (1237-1248)(2017) (1770)

Egyptian Poultry Science Journal

http://www.epsaegypt.com

ISSN: 1110-5623 (Print) – 2090-0570 (Online)

UTILIZATION OF OLIVE PULP MEAL AS A NON-TRADITIONAL FEEDSTUFF IN GROWING LOCAL HENS FEEDING UNDER DESERT CONDITIONS

K. Abd El-Galil, Mona M.Hassan, Henda A. Mahmoud , K.M. Abu El-Soud and A.A. Abd El-Dayem

Anim. and Poult. Nut. Dep., Desert Res. Center, Cairo, Egypt.

Corresponding author:Kabdelgalil@hootmail.com

Received: 12 / 11 /2017 Accepted: 28 / 11 /2017

ABESTRACT : A total number of 180 Sinai growing hens 10 weeks of age were used in an experiment lasted up to 18 weeks of age. The experiment aimed to study the utilization of feeding growing hens on different levels of olive pulp meal (OPM) under desert conditions. Experimental birds were divided randomly into four equal experimental treatments (45 in each treatment) and randomly divided into three equal replicates (15 hens each).The first treatment was fed the basal diet as a control (0 % OPM), while the other three treatments were fed diets containing either 4, 8 or 12 % OPM, respectively. Experimental diets were formulated to be iso-caloric and iso-nitrogenous and were formulated in granular form. Results obtained could be summarized as follows**:** The final live body weight and body weight gain during the whole experimental period were decreased significantly (P<0.05) with increasing dietary OPM level in the diet. The highest live body weight and body weight gain were recorded by using 8 % OPM, while, those fed on 12 % recorded the lowest one.

It is worthy noting that feed intake decreased with increasing of OPM levels. Moreover, feed conversion ratio became significantly worst (P< 0.05) with OPM level up to 12% in the diets. Digestibility coefficients of CP, CF, EE, NFE and the nutritive values expressed as DCP, TDN % and ME (kcal/kg) were significantly (P<0.05) varied among the experimental treatment. The level of 8% OPM recorded the best net return and the percentage of economical efficiency of feed. Data of amino acids content of OPM showed that Methionine was the first limiting essential amino acid, while, lysine were the second limiting amino acids.

In conclusion, from the nutritional and economical efficiency stand points of view, up to 8% OPM could be recommended to be used successfully and safely when formulating diet for Sinai local growing hens without adversely affecting their performance.

Key Words: Growing hens, olive pulp meal, performance and economical efficiency.

INTRODUCTION

The rapid increase in human population in Egypt necessitates a corresponding increase of animal products to provide adequate quantities of animal proteins. The shortage of feedstuffs is one of the major limiting factors for increasing poultry production. However, there are large quantities of non-utilized agriculture by-products such as olive cake. Olive cultivation has increased recently for oil production due to its many health benefits (Amici et al.,1991).

In South Sinai, olive cake represents the majority of agro-industrial by- products. Large areas are cultivated by olive trees, therefore, there are great amounts of olive by products without beneficial usage and are considered as wastes. Using olive pulp meal (OPM) in poultry nutrition is limited because of their low nutritive value (Sansoucy et al., 1985), high NDF and ADF (Nefzaoui, 1983), condensed tannins (Martin et al., 2003), seasonality (Sansoucy et al., 1985) and low degradability of cell wall component (Teimouri Yansari et al., 2007). Also OPM contains non-starch polysaccharides (NSP) as xyloglucan and xylanxyloglucan complexes (Coimbra et al., 1995, Rosa Rio and Domingues, 2002). The negative effect of NSP on gut ecology and function has been highlighted (Choct, 2006). On the other hand, OPM is rich in oleic acid but has moderate amounts of linoleic and palmitic acids. Moreover, it is poor in linolenic and lauric acids, also OPM contains several amino acids, the most abundant are glutamic and aspartic acids and it is limited in lysine, histidine and methionine(Nefzooui, 1997). 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. Razzaqa 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 aimed to incorporate OPM in poultry diets, in broiler (Ahmed, 1998 and Attia et al.,2001), in laying hen (Samia and Laila, 2002 and Al-Shanti,2003a.), in rabbits (Abd El-Galil, 2001). in laying quail. Abd El-Galil et al.(2007) and in growing Japanese quail Abd El-Galil et al.(2005).

MATERIALS AND METHODS

The present experiment was carried out at South Sinai Experimental Research Station (Ras-Suder City) which belongs to the Desert Research Center, during the period from July to August, 2014. The experiment aimed to study utilization of olive pulp meal (OPM) as a non-traditional feedstuff in growing local hens feeding under south Sinai conditions. A total number of 180 Sina growing hens 10 weeks of age were used in an experiment lasted up to 18 weeks of age. Growing hens were kept under similar managerial, hygienic and environmental conditions. Growing hens were divided randomly into four equal treatments (45 in each treatment) and randomly divided into three equal replicates (15 hens each). The first treatment was fed a basal diet as a control (0 % OPM), while, the other three treatments were fed diets containing either 4, 8 or 12 % OPM, respectively. All growing hens were housed in wire cages of triple deck batteries. Also, the birds were exposed to 16 hr of continuous light. The experimental birds were reared under indoor ambient temperature (36.61°C ±1.01) and relative humidity (24.2 RH (%) ±1.60) that recorded by using the electronic digital thermo-hygrometer. The experimental diets

(Table 1) were formulated in granular form according to NRC (1994) and were iso-nitrogenous (15% CP), iso-caloric (2800 kcal ME/kg). Feed was offered ad libitum and fresh water was available all time. Chemical analysis of OPM, the experimental diets and dried excreta were assayed using methods of A.O.A.C. (1990).

Live body weights (LBW) were recorded at the beginning of the experimental period (10 weeks age) and each 4 weeks till the end of the experiment (18weeks of age). Live body weight changes were calculated as the difference between the initial and final LBW. During the experimental period, individual LBW and feed intake (FI) were recorded monthly. Feed conversion ratio (g feed intake/gain) were calculated as the amount of feed consumed divided by body gain and the mortality was recorded every day. At the end of the experimental feeding period, digestion trials were conducted using 16 adult cockerels (4 for each level of OPM) to determine the digestion coefficients and the nutritive values (DCP and TDN) of the experimental diets as affected by OPM levels. Cockerels were housed individually in metabolic cages. The digestibility trials extended for 9 days of them 5 days as a preliminary period followed by 4 days as collection period. The individual LBW were recorded during the 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). Apparent 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 suggested by Titus (1961).

The economical efficiency of feed was calculated from the input/output analysis according to the costs of the experimental diets and selling price of one kg live body weight. The values of economical efficiency were calculated as the net revenue per unit of total costs.

Statistical analysis of the obtained data was carried out using General Linear Model (GLM) procedures by SAS program (2004) using simple one-way analysis of variance according to this model:

$Yij = \mu + Ti + eij$

Where:

Yij= Represented observation in j th OPM level.

μ = Overall mean.

Ti = Effect of j th OPM level (j = 0,4,8 and 12%).

eij= Random error.

Duncan's Multiple Range Test (Duncan, 1955) was conducted to get differences among treatment means.

RESULTS AND DISCUSSION

The proximate analysis and amino acid of OPM

The proximate chemical analysis of OPM indicated that CP% content was 9.24 %, values for CF, EE, NFE and ash were 18.45, 9.71, 42.58 and 7.54%, respectively

(Table 2). Fiber fractions (NDF and ADF) were recorded the values as 36.87 and 21.51 %, respectively, as shown in Table 2. Minerals content of OPM is summarized in 0.59 % Magnesium , 0.04 % Zinc , 0.08 % Copper , 0.5 % Iron , 0.37 % Calcium , 0.44% Phosphorus and 0.45% Sodium , as shown in table 2. Amino acids of OPM are evaluated and listed in Table 3. Data showed that methionine was the first limiting essential amino acid, while, lysine was the second limiting amino acids.

Live body weight and body weight gain

Live body weight (LBW) and body weight gain (BWG) during the whole experimental period are shown in table 4. The final live body weight (18 weeks) showed a significant differences ($P<0.05$) among experimental treatments. It is noting that live body weight was improved with increasing the OPM level in the diet up to 8% and the control group. Level of 12% OPM in the diet was negatively affected ($P<0.05$) on the body weight. It was observed that the 4 % OPM group was nearly similar to the level of 8% OPM one.

Body weight gain increased gradually up to treatment fed 8% OPM which recorded the highest BWG. Level of 12% OPM had the lowest ($P\leq0.05$) BWG at 18 weeks of age. It is clear that substitution of diet by 8% OPM increased weight gain by 6.36 % higher than that of the control treatment. The decrease in Body weight gain when used 12% OPM may be due to the presence of tannins, which may decrease palatability of feed, consequently, body weight decreased.

The inclusion of progressively higher quantities of OPM in the diets may have reduced the energetic value of diet and decrease in digestibility of nutrients in diets contained OPM, also may be due to the presence of tannins, which decrease palatability and depressing body weight gain. Baelum and Peterson (1964) found that the added tannin diet had a pronounced depressing effect on the body weight gain of the chicks by about 6%.The results were harmony with those of Al- Shanti et al. (2003a) who found a significant increase in body weight gain for growing chicks fed 10 % OPM. However, Attia et al.(2001) 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) and feed conversion ratio (FCR) are shown in table 4. Results showed that there were gradually decreased with levels of OPM among the experimental treatments in regard to feed intake. Birds fed 12% of OPM consumed less ($p<0.05$) feed compared to other experimental treatments. It is clear that substitution of diet by 8 and 12 % OPM decreased feed intake by 4.00 and 5.11, respectively compared to control treatment. The reduction in feed intake may be due to low palatability that resulted from the astringency of tannins in OPM.

Feed conversion ratio (FCR) revealed a significant difference ($P<0.05$) among the experimental treatment. It seems that birds received diets supplemented with 12 % OPM was less in feed conversion ratio compared to the other treatments. The reduction observed in FCR may result from the decreased body weight gain. This reduction in feed intake with the inclusion of OPM in the diet made a significant ($P < 0.05$) improve in feed conversion ratio (g feed/ g gain) with 8% OPM that was not noticed with 12% OPM . This may be attributed to the significant decrease in feed intake for those fed diet containing 12% in comparison with 8% OPM. According to Al- Shanti et al. (2003a), there was a significant decrease in feed consumption with fed different levels of fiber during the growing periods, so that there were an improvement in FCR of chicks fed diets incorporated with 10% OPM.

Mortality Rate

Mortality rate % of birds fed different levels of OPM and control diet recorded a non significant difference between treatments.

Apparent Digestibility and nutritive values

Apparent digestion coefficients % of nutrients and nutritive values expressed as DCP, TDN % and ME (kcal/kg) of the experimental diets as affected by the different levels of OPM are illustrated in Table 5.

Results indicated a decrease in digestibility coefficients of crude protein (CP %), crude fiber (CF %) and nitrogen free extract (NFE %), while increased ($P<0.05$) occurred in EE with increasing OPM levels.

Regarding the nutritive values, it is clear that DCP, TDN and ME (kcal/kg) were decreased significantly ($P<0.05$) by increasing OPM more than 8% in the diet. The decrease in digestion coefficients and nutritive values may be attributed to tannin content and lignin content of olive pulp. Martin et al.(2003) reported that olive pulp containing 1.4% tannins (on DM basis). Tannins as naturally occurring polyphenolic compound which from complexes with macromolecules (proteins, cellulose, hemicellulose, and starch), minerals and vitamins affect their availability in man and animals (Makkar, 1993). Results supported with Steerter et al. (1993) who found that tannins reduce digestibility of protein and carbohydrate by inhibiting digestive enzymes and by altering permeability of the gut wall. Mc Donald et al.(1996) reported that tannin molecules can form stable chelates with many metal ions such as zinc, copper and iron or reduce their solubility . Moreover tannins can disturb the absorption of minerals through the gastrointestinal tract. Tannins may reduce the amino acid (Jiménez-Moreno et al., 2010) and metabolizable energy of diet. González-Alvarado et al.(2007) found that tannins may reduce digestibility of protein and carbohydrate by inhibiting digestive enzymes and by altering permeability of the gut wall. Servili et al., (2014) illustrated that the nutritional value of olive oil is due to the high monounsaturated fatty acid content, principally made of oleic acid. Hydrophilic and lipophilic phenols represented the main antioxidants of olive oil and they include a large variety of compounds.

The economical efficiency of the experimental diets

Data of the economical efficiency of the study are illustrated in Table 6. The results indicated that the inclusion of 12% OPM in the diet recorded the lowest feed price that was due to the low price of OPM followed by 8 and4 % OPM, respectively. On the other hand, the level of 8% OPM recorded the best net return, the percentage of economical efficiency of feed and relative economical efficiency compared to the other levels of OPM. This improvement related to the lowest feed conversion ratio of this group, as well as the constant market price of kg meat.

IN CONCLUSION,

from the nutritional and economical efficiency stand points of view, up to 8% OPM could be recommended to be used successfully and safely in the formulated diet for Sina local growing hens without adversely affecting their performance.

ACKNOWLEDGEMENTS:

This research is a part of a project nominated "utilization of some agricultural by-products and desert plants as non-conventional feedstuffs in poultry diets" which is financially supported by Ministry of International Cooperation, Egypt.

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

Ingredients%	Level of Olive pulp meal %			
	0	**4**	**8**	**12**
Olive pulp meal	0.00	4.00	8.00	12.00
Yellow corn	66.57	65.50	62.18	59.00
Soybean meal (44% CP)	10.30	13.70	14.00	12.00
Corn gluten meal (60%CP)	5.70	4.13	4.10	5.72
Wheat bran	10.30	5.50	4.50	4..00
Limestone ground	1.40	1.41	1.43	1.45
Dicalcium phosphate	1.80	1.81	1.83	1.85
Vit. and min. premix*	0.30	0.30	0.30	0.30
DL-Methionine	0.25	0.26	0.26	0.27
L-Lysine	0.13	0.14	0.15	0.16
Salt	0.25	0.25	0.25	0.25
Sand	3.00	3.00	3.00	3.00
Total	100	100	100	100
Proximate chemical analysis %				
Crude protein	15.20	15.15	15.22	15.30
Crude fiber	3.32	3.40	4.22	4.75
Ether extract	3.30	3.41	3.65	4.01
Ash	2.33	2.35	2.65	2.83
Calculated values				
Metabolizable energy (kcal/kg)**	2801	2820	2801	2803
Calcium %	0.91	0.91	0.92	0.90
Available phosphorus %	0.40	0.40	0.42	0.43
Methionine %	0.30	0.30	0.31	0.31
Lysine %	0.70	0.70	0.71	0.71
Methionine+ cyc %	0.55	0.55	0.54	0.54
Price /kg diet (L.E.)***	2.900	2.860	2.820	2.780

* Each 3 kg Vitamins and minerals premix contains (per ton of feed), Vit. A 10000000 IU, Vit.D3 2000000 IU, Vit.E I0g, Vit.K3 1000 mg, Vit.B1 1000 mg, Vit.B2 5000mg, Vit.B6 1.5g, Vit. B12 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 the price of Olive pulp meal was 250 LE/ton.

*** Metabolizable energy (ME, kcal/kg) was calculated according to NRC (1994)and ME, Kcal/kg OPM. 2463 Kcal/kg determined according to Ahmed (1998).

****Calculated according to price of feed ingredient at the same time of the experiment.

Table (2): Proximate chemical composition of OPM

Items	%
CP	9.05
CF	18.45
EE	9.01
Ash	7.54
NDF(Neutral detergent fiber)	39.27
ADF(Acid detergent fiber)	22.01
ADL	8.97
Cellulose	27.85
Hemicellulose	15.35
Lignin	13.80
Proximate analysis mineral content %	
Magnesium	0.59
Calcium	0.37
Phosphorus	0.44
Sodium	0.45
Potassium	0.35
Zinc	0.04
Copper	0.08
Iron	0.50

Table (3): amino acid composition of OPM

Amino acid	%
Essential amino acid	
Methionine	0.05
Lysine	0.12
Arginine	0.35
Phenylalanine	0.52
Leucine	0.83
Histidine	0.29
Isoleucine	0.33
Valine	0.64
Threonine	0.47
Non Essential amino acid	
Aspartic acid	1.08
Cystine	0.08
Alanine	0.64
Glutamic acid	1.28
Glycine,	0.55
Serine	0.47
Tyrosine	0.14
Proline	0.52

Table (4): Effect of feeding different levels of OPM on performance ($\overline{x}$ ±SE) of Sina growing hens.

Periods (weeks)	Level of OPM				Sig
	Control	4%	8%	12%	
Live body weight (g)					
10	765.40 ±2.01	760.19±1.95	755.50 ±2.00	753.92 ±2.13	ns
14	924.40^{a} ±9.50	920.18^{a} ±10.10	920.00^{a} ±10.30	910.05^{b} ±12.98	*
18	1164.09^{a} ±11.01	1170.50^{a}±16.11	1175.30^{a}±18.00	1090.70^{b} ±21.10	*
Body weight gain (g)/bird /period					
10-14	159.00^{a} ±9.30	159.99^{a} ±9.11	164.50^{a} ±9.51	156.13^{b} ±9.66	*
14-18	239.69^{a} ±19.00	250.32^{a} ±19.18	255.30^{a} ±19.56	180.65^{b} ±19.16	*
10-18	398.69^{a} ±27.03	410.31^{a} ±27.60	419.80^{a} ±27.46	336.78^{b} ±27.36	*
Feed intake (g)/ bird /period					
10-14	688.47^{a} ±13.22	690.16^{a} ±10.80	640.31^{ab}±10.12	630.89^{b} ±10.55	*
14-18	820.20^{a} ±11.02	814.84^{a} ±11.36	808.00^{ab}±10.69	800.76^{b} ±11.76	*
10-18	1508.67^{a} ±22.23	1505.00^{a}±22.08	1448.31^{ab} ±32.00	1431.65^{b} ±24.29	*
Feed conversion ratio					
10-14	4.33^{a} ±0.26	4.31^{a} ±0.23	3.89^{ab} ±0.33	4.04^{b} ±0.13	*
14-18	3.42^{ab} ±0.35	3.26^{ab} ±0.31	3.16^{b} ±0.33	4.43^{a} ±0.31	*
10-18	3.78^{b} ±0.37	3.67^{b}±0.34	3.45^{b} ±0.39	4.25^{a} ±0.36	*
Morality rate %					
10-18	1.02±032	1.18±0.37	1.55±0.35	1.50±0.33	ns

a,b: Means within the same row showing different letters are significantly different.
Sig. = Significant,* = (P<0.05), ns = not significant.

Table (5): Digestion coefficients (%) of the experimental diets as affected by OPM level in growing hens diets

Items	Level of OPM %				Sig.
	Control	4	8	12	
CP	81.50 ^{a} ±3.91	80.02 ^{a} ±3.00	79.01^{a} ±3.00	76.22^{b} ±3.98	*
CF	24.95 ^{a} ±1.48	23.01^{a} ±1.42	20.82^{ab}±1.41	19.58^{b} ±1.45	*
EE	81.56^{b} ±4.12	82.86 ^{ab} ±4.11	85.56^{a} ±4.00	86.86^{a} ±4.30	*
NFE	85.52^{a} ±6.32	84.33 ^{a} ±6.00	82.44^{ab}±6.07	80.94^{b} ±6.25	*
DCP	12.39^{a} ±0.37	12.12 ^{a} ±0.38	12.03^{ab} ±0.37	11.66^{b} ±0.32	*
TDN	61.34^{a} ±5.60	58.97 ^{a} ±5.73	57.38^{ab} ±4.69	57.27^{b} ±5.06	*
ME(kcal/kg)	2576^{a} ±0.01	2477^{a} ±0.09	2410^{b} ±0.01	2405^{b} ±0.02	*

a,b: Means within the same row showing different letters are significantly different.
Sig.=Significant, *=($P<0.05$), ns=not significant.

Table (6): Economical efficiency as affected by OPM of Sina growing hens

Items	Level of OPM			
	Control	4%	8%	12%
Feed conversion ratio	3.82	3.67	3.45	4.25
Cost of kg feed (LE.)	2.90	2.86	2.82	2.78
Feed cost of kg gain (LE.)	11.078	10.50	9.729	11.82
Market price of one kg meat (LE.)	20	20	20	20
Net return (LE.)*	8.922	9.50	10.271	8.185
Economical efficiency of feed (%)**	80.52	90.51	105.5	69.25
Relative economical efficiency (%) ***	100	112.76	131	87.13

*Net return price of one Kg meat (LE.)- Cost of Kg feed (LE)
**Economic efficiency %= Net return/ price of one Kg meat (LE.)
***Relative economical efficiency% of the control, assuming that relative EE of the control = 100.

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-Galil,K.; Heba S. Aboul-Ezz and Henda A. Mahmoud 2007. Utilization of olive pulp meal as a feedstuff in laying Japanese quail diets. J. Agric. Sci. Mansoura Univ.,

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

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

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

Al-Shanti, A.A.2003b. Effect of feeding olive cake on growth performance nutrients digestibility, carcass traits and blood constituents of growing rabbits.Egypt. J. of rabbit sci. 13 (2) : 103-116 .

Amici, A., Verna, and Martillotti, F.,1991. Oliveby-products in animal feeding: improvementand utilization. In: J.-L. Tisseran andX. Alibés (eds.) Fourrageset sous-produitsméditerranéens. CIHEAM, Zaragoza,Spain, pp 149-152.

A.O.A.C.Association of Official Analytical Chemists Association of Official Analytical Chemists 1990. Association of Official Analytical Chemists. "Official methods of analysis", 15th. Ed., Washington, USA.

Attia, A.I., El-Anwar A.W. and Soliman M.N. 2001. Effect of olive pulp supplemented with or without enzyme on growth performance and carcass characteristics of broiler chicks. proceedings of the 8th conference on animal nutrition , Organized by Egypt. j. Nut and Anim. 2(4): 967-978.

Baelum, J. and V.E. Peterson 1964. Addition of tannin to corn and soybean meal. Forsogslaboratoriets Arbog. 338-339.

Choct, M., 2006. Enzymes for the feed industry:past, present and future. World. and cellular immune response and bloodparameters. Global Veterinaria 7:391-398.

Coimbra, M.A., Rigby, N.M., Selvendra, R.R.,Waldron, K.W., 1995. Investigation of theoccurrence of xylan-xyloglucan complexesin the cell walls of olive plubOlea

Duncan, D.B. 1995. Multiple range and multiple F.Test. J. Biometrics, 11: 1-42.

González-Alvarado, J. M.; E. Jiménez-Moreno; R. Lázaro and G. G. Mateos 2007. Effects of type of cereal, heat processing of the cereal, and inclusion of fiber in thediet on productive performance and digestive traits of broilers.Poult. Sci. 86:1705–1715.

Jakobsen,P.E.;S.G.KirstenandH.Niclsen1960. Fredjelighedfrogmedfierbrae" Digestibility trials with poultry".Beretingfra for sogslabortoriat, Kabenhaven, 56:1-34.

Jimenez-Moreno , E.; J.M. Gonzalez-Alvarado; D. Gonzalez-Sanchez; R. Lazaro and G.G. Mateos 2010. Effects of type and particle size of dietary fiber on growth performance and digestive traits of broilers from 1to 21 days of age. Poultry Science 89 :2197–2212

Makkar, H.P. 1993. Anti-nutritional factors in foods for livestock. Animal production in developing. Countries Occasional publication No 16. Brit. Soci. of Anim. Prod., 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.

McDonald, M.; Mila, I. and Scalbert, A. 1996. Precipitation of metal ions by plant Poly phenols: optimal condition and origin of precipitation. J. of Agric. and Food chemistry, 44: 599-606.

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., 91:111

Nafzooui A. 1997. Contribution a la rentabilite de l’oleoculture per volorisation optimale desous-produts. Seminaire Sur L’Econommie de L’olivier (CEE, CIHEAM, Tunisie), Tunis du 20 au 22 Janvier.

NRC (National Research council) 1994. Nutrient Requirements of Poultry. 9th rev. National Academy Press, Washington, D.C., USA.

Nefzaoui, A., 1983. Etude de L'utilisation Des Sous-produits de L'olivier En olive pulp. Bethlehem University Journal.Vol. 10: 33- 37.

Poult. Sci. J. 62:5-16.

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

Rosa-Rio, M., and Domingues, M., 2002. Structural characterisation of underivatised oliveplubxylo-oligosaccharides by mass spectrometrymatrix-assisted laser

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.

Sansoucy, R., X. Alibes, P.H. Berge, F. Martilotti, A. Nefzaoui and P.Zoïopoulos, 1985. Olive By-products for Animal Feed. Food and Agriculture Organization of the United Nation, Rome, © FAO

SAS 2004. Statistical Analysis System, User’s Guide, Statistics, SAS Institute, Cary, North Carolina,USA.

Steerter, M.N.; Hill, G.M.; Wagner, D.G.; Owens, F.N. and Hibberd. C.A 1993. Effect of bird resistant and non bird resistant sorghum gain on amino acid digestion by beef heifers. J. Anim. Sci., 71: 1648-56.

TeimouriYansari, A., H. Sadeghi, Z. Ansari-Pirsarai and H. Mohammad-Zadeh 2007. Ruminal dry matter and nutrient degradability of different olive cake by–products after incubation in the rumen using nylon bag technique.Int. J. Agric. Biol., 9: 439–442.

Titus,H.W. 1961. The Scientific Feeding of Chickens. Danville, Illinois, USA.

الملخص العربى

الاستفادة من مسحوق كسب الزيتون كمادة علف غير تقليدية فى تغذية الدجاج النامى المحلى تحت الظروف الصحراوية

خالد عبد الجليل، منى محمد على،هنده عبد الجليل محمود ، ، كمال مرسى ابراهيم ،عبد الدايم عبد العزيز
قسم تغذية الحيوان و الدواجن، مركز بحوث الصحراء، القاهرة، مصر

تم تنفيذ هذة التجربة لتقييم الاستفاده من مسحوق كسب الزيتون كمادة علف غير تقليدية فى علائق دجاج سينا النامى تحت الظروف الصحراوية على الأداء و الكفاءة الأقتصادية. تم استخدام 180 دجاجة سينا نامية عمر10 اسابيع واستمرت التجربه حتى عمر 18 اسبوع. وزعت الدجاجات عشوائيا الى اربعة معاملات متساوية بكل معاملة 45 دجاجة مقسمة على ثلاث مكررات بكل مكررة 15 دجاجة. تغذت المعاملة الاولى على عليقة المقارنة الخالية من مسحوق كسب الزيتون بينما تغذت المعاملات الثانية و الثالثة و الرابعة على مستويات 4% و 8% و 12% على التوالى من مسحوق كسب الزيتون. اوضحت النتائج وجود زيادة معنوية (P< 0.05) فى وزن الجسم الحى عند عمر 18 اسبوع للمعاملات المغذاة على 8 و 4% من مسحوق كسب الزيتون مقارنة بالمعاملات الآخرى. تم تسجيل افضل قيم معنوية (P<0.05) للزيادة الوزنية و كفاءة التحويل الغذائى مع المعاملات المغذاة على مستوى 8 و 4% مسحوق كسب الزيتون بالنسبة لجميع الفترات التجريبية. وجد انخفاض معنوى (P< 0.05) فى الغذاء المأكول مع زيادة مستوى مسحوق كسب الزيتون فى العليقة للفترات التجريبية من 10 الى 14 اسبوع من العمر بينما هذا التأثير لم يكن معنويا من عمر 14 الى 18 اسبوع. اظهرت نتائج المعاملات التى تغذت على 12% مسحوق كسب الزيتون اقل اداء مقارنة بالمعاملات الآخرى. من جهه اخرى فان مستوى 8% مسحوق كسب الزيتون نتج عنه افضل قيمة لصافى العائد و الكفاءة الآقتصادية للعلف و الكفاءة الاقتصادية النسبية % و اقل تكلفة للعلف لانتاج كيلو جرام زيادة وزنية. اوصت النتائج من الوجهه الغذائيه والاقصاديه الى امكانية استخدام مسحوق كسب الزيتون فى علائق دجاج سينا النامى تحت الظروف الصحراوية حتى مستوى 8%.