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Effect of Enzymatic Treatment of Saudi Date Pits on Performance of Single Comb White Leghorn Hens and the Fatty Acid Profile of Their Eggs

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Abstract: Date pits can be considered one of the un-traditional feed for layers. These pits contain high level of linoleic and oleic acids, unsaturated fatty acids, essential for human health. Pits also contain high level of fiber (13-18%). This nutrient is difficult to digests by the birds and need to be broken down. Specific enzymes can be used to break the cellulose to improve the nutritional value of the pits. As a result, energy may be released and utilized by the birds. Having this in mind, an experiment was conducted using 4 levels of ground date pits; 0, 5, 10 and 15% with or without added enzymes and studied the effect on performance of the birds and the fatty acids content of the egg. The experiment was lasted for 12 to 2 week periods. The results of the chemical analysis showed that date fats contain high percentage of Oleic Acid which may have contributed to higher level of this fat in egg yolk of birds treated with date pits. Performance criteria results provided evidence that 10% date pits can be included in the layer diet if enzymes are present without adverse effect.

Key words: Date pits, hens performance, enzymes, fatty acids

INTRODUCTION

Dates are considered one of the most important agricultural crops in Saudi Arabia. This country produces around one million ton yearly. About 50% of this production is consumed locally as food while 4% only is exported. Date factories utilize around 9.5% from the total production to be packed with or without pits. This results in to a large amounts of discarded pits, since pits represent 10% of the fruit.

Attalla and Harraz (1996) investigated the chemical composition, including mineral contents, of the pits of 11 date palm cultivars grown in the Qassim region of Saudi Arabia. Date pits contained 57.7-68.9% total carbohydrates, 3.8-5.8% total sugars, 5.1-7.5%total protein and 8.7-12.3% crude fat.

Several researchers showed that date pits contained more fiber than the whole dates or date meat. Harry (1936) stated that the crude fiber of date pits ranged from 13.6 to 18.1%. Similar observations were obtained by Salem and Hegazi (1971) who reported that date pits contained about 17.9% crude fiber, However, Kamel *et al*. (1981) reported that the fiber content of six Iraqi date pits varieties ranged from 21.5 to 47%.

Chickens do not produce enzyme cellulase that can hydrolyze the cellulose to simple sugar. Therefore the cellulose portion of the fiber would be poorly utilized by birds unless cellulase is added to the diets of the birds. Al-saffar *et al*. (2012) investigated the effect of phytase and/or multi enzymes (protease, amyloglucoidase, xylanase, B-glucanase, cellulose and hemicellulase) on improving the utilization of Date Pit (DP) in laying hens. They showed that date pits could be included in laying hens diets up to 30% when supplemented with the multi enzymes used.

Hamada *et al*. (2002) provided evidence that date pits from three cultivars, namely; fard, Khalas and Lulu of UAE contained 9.9, 13.2 and 10.5% fat, respectively. They further reported that date pits from these varieties contained substantial amounts of oil that need to be characterized. They even suggested that due to the high oil content, conditioning and milling procedure must be changed to avoid rancidity.

These oil need to be investigated to determine the fatty acid profile of the fats and if they prove to be of the healthy ones such as omega 3 or 6 fatty acid then this is an added benefit to the pits.

Horrobin and Huang (1987) reported that An increase in linoleic acid intake lowers plasma cholesterol in human and is one of the safest methods for achieving this end Kamel *et al*. (1981) analyzed the amounts of fatty acid in Zahdi pits to be capric 0.03%, caprillic 0.03, lauric 1.27, myristic 0.52%, palmetic 0.6%, stearic 0.02% and oleic and linoleic acids 2.85%. Linoleic and oleic contents constituted a substantial percentage of the lipid fraction in the pits and amounted for 52% of the total fat.

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This study was carried out to investigate the possibility of using ground date pits in the layers, diet and study their effect on performance of the birds and fatty acid profile of the eggs.

MATERIALS AND METHODS

Chemical analysis: Date pits were milled in a heavy-duty grinder to pass through 1.2-mm screens. Moisture, crude fat, protein, ash and acid and neutral detergent fibres were determined using standard analytical procedures# 934.01, 960.39, 988.05, 942.05 and 962.09, respectively (AOAC, 1990). Calcium was determined using perkin Elmer Atomic Absorption Spectrophotometer. Phosphorus was determined using spectrophotometric molybdovanate method described in AOAC (1990). Determination of Amino Acids and Fatty acids content of the pits were performed using appropriate techniques as described in 996.01 AOAC (1990).

True Metabolizable Energy determination of the date pits: TME of the seeds was estimated according to the method developed by Sibbald (1976). Four White Leghorn Cockerels were housed individually in cages and starved for 24 hours before being forcibly fed 40 gm of ground date pits. Two cocks were unfed and used as a control.

Forced feeding was accomplished using a stainless-steel funnel with a 35 cm long stem and 1.3 cm outer diameter and plunger fitted in 0.9 cm outer diameter. The funnel containing the ground date pits was pushed down the esophagus of the cock till the end of the crop was reached. The plunger will then push the feed in question down the crop of each roaster. Sibbald (1980) suggested that in adult White Leghorn cockerels, the optimum input of test material as pellet was 30-40 or 25-30 gm as ground feed.

The birds fed date pits and those kept unfed (control) were placed in the cages and excreta voided was collected quantitatively after 48 hours (Schang and Hamlton, 1982). The collected feces was dried at 54°C for 24 hrs in an oven, weighed and left outside the oven to equilibrate with atmospheric moisture.

Ground samples and excreta collected were assayed for gross energy using a diabatic oxygen bomb calorimeter (AOAC, 1990).

True Metabolizable energy of the pits was estimated using the following equation as adopted by Sibbald (1976):

$$TME\ (Kcal/g\ air\ dry) = (GE_f * X)-(Y_{ef}-Y_{ec})/X$$

Where:

- Ge_f is the gross energy of the feeding stuff (Kcal/g)
- Y_{ef} is the energy voided as excreta by the fed bird
- Y_{ec} is the energy voided as excreta by the unfed bird
- X is the weight of feeding stuff fed (g)

TME for the date pits = (2.837*40)-(1.6158-1.5577)/40 = 2.835 kcal/g = 2835 kcal/kg

Bioassay: This study was conducted to evaluate the effect of incorporating different levels of pits obtained from different varieties of Saudi dates as a partial substitute of corn in the diets of layers.

Diets will be formulated to contain 0, 5, 10 and 15% date pits. These dietary treatments were fed with or without enzymatic treatments (100 gm of ROXAZYME G2 (Cellulase-glucanase-xylanase) per ton of feed.

The formulation of these diets depended on the values of determinant TME, proximate, Amino acids, Ca, P and other analysis of the date pits. The ingredients and calculated composition of the experimental diets are presented in Table 1.

Three hundred female day-old leghorn chicks were brought to the experimental unit and exposed to all management practices during the starting and growing periods according to the breeder recommendation. Lower density growing feed was given to the birds as they grew to reach target weight. Lighting hours were held constant at 10-11 hours daily/daily till the end of the period. Photo-stimulation were not done till the birds are 1250-1300 gm in weight. During the period preceding this practice, the birds were fed pre-lay diet containing higher protein higher calcium level. One hundred sixty pullets were placed in cages in a rate of 5 per cage. This formed 32 cage-units. The eight treatments were distributed randomly on the 32 cages in such away that each treatment was fed to 4 cages (reps), each containing 5 birds.

Eggs were collected daily however, calculation of hen-day egg production and egg weight were made on bi-weekly basis. At the end of each 28-day period, three days of egg collection were used for shell quality determination, Haugh Unit (albumin height) and yolk color. Specific gravity method was used to measure the shell quality of the eggs. This method was described in (North, 1984). Eggs in-baskets were consecutively be immersed in nine salt solutions of different specific gravities ranging from 1.060 to 1.10 with an increment of 0.005. Eggs that float were given the designated specific gravity value of that bucket. The higher the specific gravity values the better the shell quality. Feed was given ad-libitum daily. Feed left was weighed at the end of each week to determine feed intake. The feeding trial continued for 12-two weeks periods.

Statistical analysis: Summarized data for all response variables were subjected to combined analysis

in Completely Randomized Design (CRD) where Level of date pits (TRT) was considered the main effect on traits while adding enzyme (E) was the secondary effect. (Steel and Toorie, 1984). General Linear Models procedure in the PC-SAS® (SAS Institute, 1989) was used to estimate the variations among the means. Variable means showing significant differences in the analysis of variance table were compared using the Duncan Multiple Range Test (DMRT) (Duncan, 1955).

RESULTS AND DISCUSSION

The chemical analysis: The chemical analysis of the date pits showed that Date pits from different varieties contained 2.5% moisture, 6.4% protein; 5.80% fat; 30.40% crude fat and 1.15% ash (Table 2). Accordingly, total carbohydrate content of the date pits may add up to be about 56. Some of these values were in contrast to Hamada *et al.* (2002) in UAE They found that the three leading dates in UAE, Fard, Khalas and Lulu contained 7.1-10.3%moisture, 5.0-6.3% protein; 9.9-13.5% fat; 46-51% acid detergent fibre; 65-69% neutral detergent fibre; and 1.0-1.8% ash. However, Based on a study by Al-Farsi and Lee (2008) that pits of date palm contain 3.10-7.10% moisture, 2.30-6.40% protein, 5.00-13.20% fat, 0.90-1.80% ash and 22.50-80.20% dietary fiber.This would certainly prove that dates from different geographical area may differ in their contents. Our concern here is the fat level since the theory of this experiment was built on the fact that date pits contained 5-10%.Different fat level may not affect the chemical content of the fat which proven to be very high in oleic acid (Table 3). This acid can lower total cholesterol level and raise levels of high-density lipoproteins (HDLs) while lowering Low-density Lipoproteins (LDLs), also known as the "bad" cholesterol (Lopez-Huertas, 2010). Oleic acid exhibits further benefits. It has been shown to slow the development of heart disease (Lopez-Huertas, 2010) and promotes the production of antioxidants. It is interesting to note that level of linoleic acid, an essential fatty acid for the chick is also abundant in these pits. In general the Unsaturated fatty acids level was higher in the pits of this study than the saturated ones (58.4% vs 41.6). The highest constituent of the date pit sample was the fiber (Table 2). This was also recognized by Al-Farsi and Lee (2007) and Habibi Najafi (2011). Hamada *et al.* (2002) and categorized the date pit fiber in to 46-51%

Table 1: The feed ingredients and calculated composition of the layers, diet

	Date pits (no enzyme added)				Date pits (+ enzyme)		
Feed ingredients	Control	5	10	15	5	10	15
Corn	60.10	54.00	48.50	42.50	54.00	48.50	42.5
SBM, 44 %	25.2	25.8	25.5	25.8	25.8	25.5	25.8
Fish meal	3.00	3.00	3.50	3.70	3.00	3.50	3.70
Limestone	8.16	8.18	8.10	8.14	8.18	8.10	8.14
MVMIX1	0.25	0.25	0.25	0.25	0.25	0.25	0.25
DL-METH	0.20	0.20	0.20	0.20	0.20	0.20	0.20
DIC .PHO.	0.60	0.60	0.60	0.60	0.60	0.60	0.60
L-Lysine	0.10	0.10	0.08	0.08	0.10	0.08	0.08
CHOL-CL	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Salt	0.40	0.40	0.40	0.40	0.40	0.40	0.40
VEG.OIL	1.49	2.02	2.37	2.88	2.02	2.37	2.88
Antioxidant	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Date pits	0.00	5.00	10.00	15.00	5.00	10.00	15.00
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Calculated composition							
Protein, %	18.00	18.00	18.00	18.00	18.00	18.00	18.00
ME, Kcal/Kg	2800	2800	2800	2800	2800	2800	2800
Calcium, %	3.52	3.53	3.53	3.56	3.53	3.53	3.56
A-phos., %	0.33	0.33	0.35	0.36	0.33	0.35	0.36
Riboflavin, mg/kg	1.71	1.64	1.59	1.53	1.64	1.59	1.53
Niacin, mg/kg	23.38	22.08	20.96	19.7	22.08	20.96	19.7
PA, mg/kg	6.68	6.52	6.3	6.12	6.52	6.30	6.12
Choline, mg/kg	1403	1380	1353	1329	1380	1353	1329
Methionine, %	0.49	0.49	0.49	0.49	0.49	0.49	0.49
Met + Cys, %	0.79	0.78	0.78	0.78	0.78	0.78	0.78
Lysine, %	1.13	1.15	1.14	1.16	1.15	1.14	1.16
Tryptophan, %	0.34	0.24	0.23	0.23	0.24	0.23	0.23
Threonine, %	1.30	1.18	1.09	0.98	1.18	1.09	0.98
Linoleic Acid, %	1.43	1.30	1.18	1.05	1.30	1.18	1.05

[1]The multi vitamin-minerals premix provide the following per ton of diet: 7000000 IU, vit A; 1500000 ICU, vit D3; 30000 IU, vit E; 50000 mg, vit C; 2300 mg, vit K; 1400 mg, vit B1; 5520 mg, vit B2; 2300 mg, vit B6; 12 mg, vit B12; 27600, mg Niacin; 920 mg, Folic acid; 6900 mg, PA; 92 mg, Biotin; 50000 mg, Antioxidant (BHT); 220 mg, Cobalt; 4400 mg, copper; 800 mg, Iodine; 26400 mg, Iron; 44000 mg, Manganese; 180 mg, Selenium; 44000 mg, Zinc

Table 2: The proximate analysis of the date pit

Description	%
Moisture	2.55
Crude protein	6.40
Ether extract	5.58
Crude fiber	30.40
Ash	1.15

Table 3: The fatty acid profile of the date pits

Fatty acids in pits fat[1]	
CAPRYLIC ACID $C_8H_{16}O_2$	0.105
CAPRIC ACID $C_{10}H_{20}O_2$	0.185
LAURIC ACID $C_{12}H_{24}O_2$	15.100
TRIDECANOIC ACID $C_{13}H_{26}O_2$	0.025
MYRISTIC ACID $C_{14}H_{28}O_2$	10.160
PENTADECANOIC ACID $C_{15}H_{30}O_2$	0.020
PALMITOLEIC ACID $C_{16}H_{30}O_2$	0.035
HEPTADECANOIC (MARGARIC) ACID $C_{17}H_{34}O_2$	0.065
STEARIC ACID $C_{18}H_{36}O_2$	3.670
ELAIDIC ACID $C_{18}H_{34}O_2$	0.040
OLEIC ACID $C_{18}H_{34}O_2$	50.00
LINOLEIC ACID $C_{18}H_{32}O_2$	7.725
EICOSANOIC (ARACHIDIC)ACID $C_{20}H_{40}O_2$	0.540
LINOLENIC ACID $C_{18}H_{30}O_2$	0.050
11-EICOSENOIC ACID $C_{20}H_{38}O_2$	0.385
DOCOSANOIC (BHENIC) ACID $C_{22}H_{44}O_2$	0.460
13-DOCOSENOIC ACID(ERUCIC) $C_{22}H_{42}O_2$	0.095
TRICOSANOIC ACID $C_{23}H_{46}O_2$	0.095
TETRACOSANOIC ACID $C_{24}H_{48}O_2$	0.285
6,9,12,15 -DOCOSATETRAENOIC ACID $C_{22}H_{36}O_2$	0.025
PENTACOSANOIC ACID $C_{25}H_{50}O_2$	0.035
HEXACOSANOIC ACID $C_{26}H_{52}O_2$	0.040

[1]**Remarks:**
saturated fatty acid - 41.645%,
unsaturated fatty acid-58.355%

acid detergent fiber and 65-69% neutral detergent fiber. The latter is quite high which indicate the presence of high amount of lignin and probably some resistant starch, they further added. The effect of different levels of date pits with or without added enzyme on the fatty acids content of the yolk fat is presented in Table 4 and some of the most Important fatty acids were graphed in Fig. 1. Fifty percent of the pit fat sample was oleic acid This probably had contributed to the high level of Oleic acid in the egg yolk comparing to the control. It seems that Oleic acid was efficiently deposited in the egg yolk especially in hens fed 5% date pits with no enzyme added. Other fatty acids levels were not high enough in pits to contribute meaningfully to the yolk fat (Table 4 and Fig. 1).

Performance of the birds: Feeding different levels of date pits regardless of the enzymes added affected the performance of the birds (Table 5). Hen-day production, Feed conversion and egg mass were significantly ($P<0.05$) better with control group comparing to the birds fed 15% date pits. However, The statistical analysis showed a highly significant interaction between date pits and the added enzymes (Table 5) which probably nullify the first effect. It is clear that best production was observed in birds fed 10% pits when enzyme was added. However, because these birds also produce the smallest eggs and their intake was the highest, feed conversion was not the best. These results agreed with the study conducted by Hermes and Al-Homidan (2004) who fed Hens diets containing 10% date pits meal. They found improved productive performance egg production (H.D%), egg weight (g), egg mass and feed conversion

Table 4: Effect of feeding different levels of date pits with or without enzymes added on the fatty acid profile of the egg yolk

Fatty acid profile	Cont.	2	3	4	5	6	7	8
Lauric Acid $C12H_{24}O_2$	0.10	0.04	0.02	0.06	0.02	0.02	0.04	0.05
Myristic Acid $C_{14}H_{28}O_2$	0.54	0.42	0.61	0.75	0.44	0.52	0.62	0.74
Pentadecanoic Acid $C_{15}H_{30}O_2$	0.06	0.07	0.04	0.06	0.04	0.04	0.05	0.05
Palmitic Acid $C_{16}H_{32}O_2$	31.36	26.84	31.5	28.84	30.06	29.48	28.82	29.84
Palmitoleic Acid $C_{16}H_{30}O_2$	4.20	2.38	3.81	2.87	2.84	3.16	2.57	2.52
margaric Acid $C_{17}H_{34}O_2$	0.12	0.16	0.11	0.10	0.11	0.12	0.09	0.11
Stearic Acid $C_{18}H_{36}O_2$	7.92	9.59	7.98	8.25	9.44	8.76	8.40	7.68
Elaidic Acid $C_{18}H_{34}O_2$	0.08	0.32	0.08	0.06	0.08	0.08	0.28	0.20
Oleic Acid $C_{18}H_{34}O_2$	38.46	42.54	41.04	40.08	40.38	40.56	39.16	40.22
Linoleic Acid $C_{18}H_{32}O_2$	12.87	12.38	11.04	13.77	11.54	12.78	13.84	13.15
Eicosanoic Acid $C_{20}H_{40}O_2$	0.020	0.06	0.04	0.04	0.03	0.04	0.03	0.03
Linolenic Acid $C_{18}H_{30}O_2$	0.31	0.23	0.20	0.27	0.20	0.27	0.26	0.21
11-Eicosanoic Acid $C_{20}H_{38}O_2$	0.20	0.18	0.17	0.22	0.15	0.20	0.19	0.21
11,14-Eicosadienoic Acid $C_{20}H_{36}O_2$	0.11	0.12	0.11	0.12	0.10	0.14	0.12	0.12
Docosanoic (bhenic) Acid $C_{22}H_{44}O_2$	0.04	0.05	0.04	0.04	0.04	0.02	0.04	0.04
7,10,13-Eicosatrienoic Acid $C_{20}H_{34}O_2$	0.16	0.12	0.16	0.18	0.17	1.18	0.18	0.19
5,811,14-Eicosatetraenoic (Archidonic) Acid $C_{20}H_{32}O_2$	1.60	1.92	1.20	1.62	1.90	1.68	2.14	1.78
Tricosanoic Acid C23H46O2	0.01	0.04	0.01	0.03	0.02	0.02	0.01	0.02
5,8,11,14,17-Eicosapentanoic Acid $C_{20}H_{30}O_2$	0.05	0.10	0.07	0.10	0.09	0.06	0.10	0.08
Tetracosanoic (Lignoceric) Acid $C_{24}H_{48}O_2$	0.06	0.06	0.07	0.05	0.04	0.02	0.05	0.06
4,7,10,13,16-Docosapentaenoic Acid $C_{22}H_{34}O_2$	0.09	0.14	0.08	0.10	0.08	0.06	0.08	0.08
4,7,10,13,16,19-Docosahexaenoic Acid $C_{22}H_{32}O_2$	1.75	2.27	1.61	2.40	2.25	1.79	2.92	2.60

1 = CONTROL, 2 = CONTROL+5% DATE PITS, 3 = CONTROL+10% DATE PITS, 4 = CONTROL+15% DATE PITS, 5 = CONTROL+ENZYME, 6 = CONTROL+5% DATE PITS+ENZYME, 7 = CONTROL+10% DATE PITS+ENZYME, 8 = CONTROL+5% DATE PITS+ENZYME

Table 5: The effect of feeding different levels of date pits with or without added enzyme on production traits of single comb white leghorn[1]

Source of Variation	GBD	FC	HD	EM	EW
Levels	NS	**	**	**	NS
0	109.6^{ab}	1.895^{c}	91.35^{a}	58.52^{a}	64.08^{a}
5	108.2^{b}	1.952^{bc}	88.23^{a}	56.95^{a}	64.59^{a}
10	113.3^{a}	2.048^{ab}	88.07^{a}	56.22^{a}	63.85^{a}
15	109.4^{ab}	2.117^{a}	84.16^{b}	53.89^{b}	64.12^{a}
P =	0.1147	0.0068	0.0008	0.0009	0.3295
Treatments	NS	NS	NS	NS	*
+ EZ	110.4^{a}	2.037^{a}	87.71^{a}	55.92^{a}	63.86^{a}
- EZ	110.0^{a}	1.971^{a}	88.19^{a}	56.87^{a}	64.46^{b}
P =	0.7907	0.1801	0.6985	0.2431	0.0365
Interaction	NS	**	**	**	*
0 + EZ	110.5±13.4	1.922±0.312	91.66±6.41	58.46±4.53	63.81±1.92
5 + EZ	106.4±13.8	1.923±0.486	88.06±13.32	56.74±8.08	64.57±1.96
10 + EZ	114.9±16.6	2.001±0.335	92.10±7.25	57.83±4.63	62.82±2.23
15 + EZ	109.6±15.4	2.297±0.729	79.04±17.47	50.64±10.86	64.24±2.82
0 - EZ	108.8±10.6	1.869±0.250	91.04±6.25	58.58±4.41	64.34±1.77
5 - EZ	110.1±14.4	1.983±0.399	88.42±12.16	57.16±8.69	64.62±3.90
10 - EZ	111.7±13.0	2.094±0.413	84.03±11.80	54.61±8.41	64.89±2.37
15 - EZ	109.2±12.4	1.938±0.349	89.28±8.48	57.14±5.90	64.00±2.91
P =	0.4347	0.0039	< 0.0001	0.0004	0.0229

[1]Means Within columns carrying different superscripts are significantly different, P<0.05. NS = Not significant, P>0.05. **Significant at 1% level of probability GBD = gram per bird per day, daily feed intake; FC = Kg feed per Kg eggs, feed conversion; EW = gram egg weight; HD = percent hen-day production; LIV = percent livability; EM = gram per hen-day egg mass (% HD*EW), LVL = 0, 5, 10 and 15% of date pits, TRT = +EZ, Enzyme was added, -EZ, Enzyme was not added

Table 6: The effect of feeding different levels of date pits with or without added enzyme on some egg characteristics and livability of single comb white leghorn hens[1]

Source of variation	SPG	YC	HU	LIV
Levels	NS	NS	NS	NS
0	1.081^{a}	4.60^{a}	76.89^{a}	99.84^{a}
5	1.079^{a}	4.30^{a}	77.84^{a}	98.71^{b}
10	1.081^{a}	4.41^{a}	78.30^{a}	99.21^{ab}
15	1.080^{a}	4.53^{a}	79.11^{a}	99.71^{ab}
P =	0.4944	0.2674	0.7238	0.0843
Treatments	NS	NS	*	NS
+EZ	1.080^{a}	4.38^{a}	76.65^{a}	99.42^{a}
-EZ	1.080^{a}	4.53^{a}	79.42^{b}	99.32^{a}
P =	0.8118	0.2361	0.0474	0.7541
Interaction	NS	NS	NS	NS
0+EZ	1.081±0.008	4.46±0.95	75.67±10.67	99.69±1.39
5+EZ	1.080±0.008	4.23±1.01	75.98±11.22	99.43±2.42
10+EZ	1.084±0.019	4.40±1.06	77.93±12.10	99.15±2.76
15+EZ	1.078±0.007	4.47±1.28	77.02±13.60	99.43±3.00
0-EZ	1.081±0.007	4.73±1.12	78.11±13.71	100.0±0.00
5-EZ	1.080±0.008	4.36±0.80	79.71±10.06	97.99±6.74
10-EZ	1.079±0.008	4.42±1.14	78.67±15.31	99.27±2.62
15-EZ	1.080±0.008	4.60±1.28	81.19±12.01	100.0±0.00
P =	0.2581	0.8904	0.8202	0.1664

[1]Means Within columns carrying different superscripts are significantly different, P<0.05. NS = Not significant, P>0.05. **Significant at 1% level of probability; SPG = Specific gravity of the egg; YC = Yolk color; HU=Haugh Unit; LIV = percent Livability, LVL = 0, 5, 10 and 15% of date pits, TRT = +EZ, Enzyme was added, -EZ, Enzyme was not added

ratio (kg Feed/kg Egg) comparable or better than other treatments and control. In the same line, Al-saffar *et al.* (2012) reported that Inclusion of 15 and 30% date pits in the diets decreased laying rate by 9.9 and 3.2%, respectively, However, the decrease was only significant in 15% date pit group. Inclusion of Phytase and multi enzymes (mixture containing protease, amyloglucoidase, xylanase, betaglucanase, cellulase and hemicellulose of fungal origin), improved (P<0.0001) laying rate of hens fed 15% date pits diet by 12.9, 16.9 and 17.2%, respectively, compared to 15 and 30% Date Pits, respectively, They further added. Specific gravity, yolk color, Haugh unit and livability were significantly affected by date pits level nor there any significant effect of the interaction between the pits and the enzymes (Table 6).

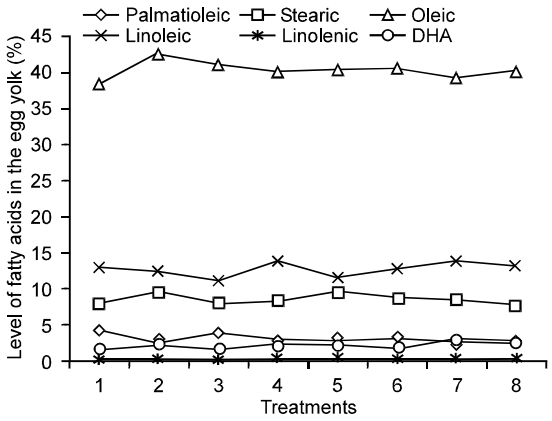

Fig. 1: The effect of date pits on fatty acid profile of the egg

Putting all the facts together we would assume that somewhere between 5 and 10% percent date pits with enzymes can be added safely to the layer ration and still obtain an optimum performance.

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