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UTILIZATION OF DATE STONE MEAL BY FEEDING GROWING JAPANESE QUAIL

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ABSTRACT

A total of 180 Japanese quail chicks at one day-old were used in an experiment, which lasted 6 weeks. The experiment aimed to study the utilization of date stone meal (DSM) as agro-industrial by-products by feeding growing Japanese quail.

Quail chicks were divided into 4 equal experimental groups of 45 chicks each. Every group was sub-divided into three replicates (15 chicks/ rep.). The first group was fed the basel diet as a control (0% DSM), while, the other three groups were fed diet containing 5,10 or 20% DSM. The experimental diets were isocaloric and isonitrogenous .

Results obtained could be summarized as follows:

Live body weight, body weight gain and feed intake were significantly ($P<0.05$) decreased with the increasing of DSM % in the diets. Moreover, feed conversion ratio (g feed/g gain) became significantly worst ($P< 0.05$) by increasing DSM up to 20% in the diets.

Digestion coefficients of CP, CF and NFE % were significantly decreased by increasing DSM in the diets. However, digestion coefficient of EE was not significantly influenced by the different levels of DSM. Different levels of DSM in diets caused significantly ($P< 0.05$) decreases in dressing percentage with the increase of DSM up to 20% . The 10 % DSM level showed the best net return as well as the highest value of economic efficiency among all experimental groups. Serum TP, AL, GL, A/G ratio, Cr and Ur recorded a non-significant difference between quail groups. Serum ALT, AST enzymes recorded an increase ($p<0.05$) with increasing DSM levels, and however cholesterol level decreased.

From the nutritional and economical efficiency stand points of view, the date stone meal could be recommended to be used successfully and safely in formulating diets for growing quail, if included up to 10% without adversely affecting their growth performance or physiological parameters.

Key words: Quail, date stone meal (DSM), growth performance, digestion trials, carcass traits, and some physiological parameters

INTRODUCTION

Now there are new sources of poultry feed ingredient that are based on rational utilization of all available feed raw materials. The general trend is to find the available and cheaper raw materials contributing to saving of costly feeds, which are in short supply.

Using untraditional feeds in poultry feeding can substantially participates in solving this problem and decreases the cost of feed which in turn, decreases the marketing price of poultry production, reduce

environmental pollution and ameliorate the situation by creating new feeds from waste materials.

In egypt, there are large quantities of untraditional inexpensive feed resources and agricultural by-products available such as date stone meal (DSM) , can be used in quail chicks feeding as a particle substitute for the conventional feed stuffs, as a cheap untraditional feedstuffs.

Date stone meal is rich in nutrients. *Kolif and Abo El- Nor (1993)* reported that the protein content of date stone consists of seven amino acids namely aspartic, glutamic, arginine, proline, threonine, methionine and lysine, where, it is rich in arginine and proline, arginine being the major amino acid. *Abd El-Naby (1999)* found that the major amino acids in date stone were glutamic , aspartic and arginine being 17.79,10.93 and 8.68g/100g protein, respectively. Lysine and methionine which are well known as limiting acids in diets based on cereals and legumes were slightly higher in date stone, being 6.87and 2.69 g/100 g protein, respectively. The results of mineral content in date stone indicated that K, P, Ca, Mg and Na were the major minerals in different date stone, while microelements such as Fe, Mn, Zn and Cu were found in low concentrations (*Abd El- Naby, 1999*).

There are some researches on its use in quail *El-Bogdady et al.* (1994), *El-Bogdady* (1995) *and El–Nagme.et. al.* (2001)

There is little information in literature concernins the use of date stone meal in feeding growing quail

The main objective of the present work was to evaluate date stone meal and to study its effects on growth performance, economic efficiency, digestion coefficients, 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 date stone meal (DSM) as a non conventional feedstuff in growing Japanese quail diets .

Firstly, 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 date stone meal (DSM), using 8 mature quail males (4 in each trail). In the 1st trail, the ME of yellow corn (YC) was determined directly .In the 2nd trail, ME value of DSM (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 .

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

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

The experimental diets (Table 1) were formulated using 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 .

At the end of the experimental feeding period, digestion trials were conducted using 20 males quail (five from each treatment) to determine the digestion coefficients of the experimental diets.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 Tiuts 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 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 DSM content in the experimental diets

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

Ingredient %	Control	Levels of date stone meal		
		10%	15%	20%
Date stone meal	0.00	10.00	15.00	20.00
Soybean meal (44%)	11.30	11.57	11.75	15.67
Yellow corn	56.00	49.00	45.50	43.00
Concentrate *(52%)	10.00	10.00	10.00	10.00
Corn gluten meal (60%)	11.84	12.20	12.30	10.00
Wheat bran	9.53	5.90	4.10	0.00
Dicalcium phosphate	0.44	0.36	0.38	0.42
Vit. and min. mix**	0.30	0.30	0.30	0.30
L- lysine	0.38	0.42	0.43	0.36
Dl- methionine	0.21	0.25	0.24	0.25
Total	100	100	100	100
Proximate chemical analysis %				
Crude protein (CP)	24.10	23.93	23.80	23.72
Crude fiber (CF)	3.45	3.85	4.19	4.45
Ether extract (EE)	3.68	3.88	4.02	4.19
Calculated values :				
Metabolizable energy (Kcal/kg)***	2900	2906	2906	2905
Calcium %	0.86	0.82	0.83	0.83
Available phosphorus %	0.30	0.30	0.30	0.30
Methionine %	0.52	0.52	0.52	0.52
Lysine %	1.30	1.30	1.30	1.30
Methionine +Cysteine %	0.75	0.75	0.75	0.75
Price /Kg diet (LE)****	1.46	1.40	1.36	1.35

* Protein concentrate contain: 52%Crude protein, 2.03% Crude fiber, 6.17% Ether extract, ME 2080 (Kcal/Kg) ,1.50 % Methionine, 2.00% Methionine and Cystine, 3.0 % Lysine, 7.00% Calcium , 2.93 % Avalailable Phosphorus, 2.5 % 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 DSM .

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

RESULTS AND DISCUSSION

Chemical analysis, digestibility and nutritive values of date stone meal (DSM).

Proximate chemical analysis of DSM indicated that crude protein content (CP) was 7.65%, while, crude fiber (CF), ether extract (EE) and nitrogen free extract (NFE) were 10.57, 7.91 and 72.10%, respectively. The results obtained indicated that the apparent digestion coefficients of CP, CF, EE and NFE were 69.30, 13.03, 77.3 and 72.1%, respectively.

The nutritive values of DSM expressed as DCP, TDN and ME (Kcal/kg) were 5.30, 64.58 % and 2675 Kcal/Kg, respectively. These results were nearly similar to those of *El–Nagme.et al.* (2001) who reported that CP, CF, NFE and ME (Kcal/kg) for date stone meal were 7.50, 13.01, 69.63 % and 2757 Kcal/kg, respectively. *Hiti and Rous* (1978) reported that CP and CF for date stone were 8.10% and 9.10 %, respectively. It must be mentioned that these discrepancies in proximate chemical analysis of DSM among the different literature might be due to the nature, source and degree of maturity of date stone content.

Live body weight and weight gain.

The effects of dietary treatments on growing performance are summarized in Table 2. Average live body weight (LBW) and average body weight gain (BWG) during the experimental period (0-6 weeks of age) showed gradual decrease with elevaling the DSM in their diet from 0.00 up to 20% with quail a significant differences ($P < 0.05$) between groups . In other words, the incorporation of DSM in quail diets decreased LBW, where , at 6 weeks of age by about 1.33 ,6.37 and 10.45%, than the control when the DSM was 10,15 and 20% of the diet, respectively. It was noticed that the BWG in quail fed 10% DSM level recorded the highest value after the control,

The inclusion of DSM in quail diets at 10,15 and 20 % results in poor BWG than that control group at all intervals studied.The obvious and significant ($P < 0.05$) decrease was obtained when the DSM reached 20% of the diet.

The decrease in BWG may be due to the decrease in feed intake and digestibility of nutrients in diets contained DSM at any level from 10 to 20 % . These result agreed with those of *Afifi et al.* (1966) who found that the best improvement in weight gain of broiler was obtained with the inclusion of 10% followed by 5% DSM in the diets. Also, *Kamel et al.* (1981) observed a significant increase in growth rate broiler at the 5 and 10% inclusion levels and a decreased at 15% level of DSM. On the other hand ,*Jumah et al.* (1973) used three levels (5, 10 or15 %) of DSM in the diet of broiler , the final weights of chicks fed on diets contained any levels 5, 10 or 15% were lower than the control. Decrease, in BWG was noticed by *Soliman* (1996) in chicks fed 5, 10 or 15% DSM and this decrease was significant at 10 and 15% levels. *El-Bogdady* (1995) recorded that body weight and weight gain decreased with the inclusion of DSM at levels of 10 or 15% in growing quail diets.

Table (2) Effect of feeding different levels (Mean ±SE) of date stone meal on growth performance of quail.

Items	Control	Levels of date stone meal			Sig.
		10 %	15 %	20 %	
Live body weight (LBW) (g)					
Initial	8.39 ±0.48	8.41±0.41	8.40±0.19	8.42±0.16	ns
2 weeks	51.79±0.78^{A}	50.86±0.85^{A}	49.33±0.98^{AB}	47.24±1.30^{B}	*
4 weeks	110.47 ±1.2^{A}	108.37±0.92^{A}	103.18±1.78^{B}	98.53±2.04^{B}	*
6 weeks	182.21± 1.5^{A}	179.78±2.04^{A}	170.6±3.08^{AB}	163.12±3.3^{B}	*
Weight gain (WG)(g)/bird /period					
0-2 weeks	43.40±0.05^{A}	42.45±0.40^{A}	40.93±0.86^{A}	38.82±1.14^{B}	*
2-4 weeks	58.68±0.77^{A}	57.51±0.75^{A}	53.85±1.61^{AB}	51.29±0.79^{B}	*
4-6 weeks	71.74±0.95^{A}	71.41±1.02^{A}	67.42±2.15^{AB}	64.59±1.91^{B}	*
0-6 weeks	173.82±1.12^{A}	171.37±1.70^{A}	162.2±2.16^{AB}	154.7±3.20^{B}	*
Feed intake (FI) (g)/ bird /period					
0-2 weeks	120.92±1.20^{A}	114.96±1.55^{AB}	113.93±2.12^{AB}	108.25±3.55^{B}	*
2-4 weeks	232.35±1.08^{A}	222.70±1.27^{AB}	221.73±2.71^{AB}	216.18±4.08^{B}	*
4-6 weeks	329.84±1.63^{A}	323.63±2.85^{A}	328.87±1.41^{AB}	316.03±3.16^{B}	*
0-6 weeks	683.11±3.28^{A}	661.29±2.44^{AB}	658.53±3.26^{AB}	640.46±4.16^{B}	*
Feed conversion ratio (FCR)					
0-2 weeks	2.79±0.03^{B}	2.71±0.04^{B}	2.78±0.04^{A}	2.79±0.06^{A}	*
2-4 weeks	3.96±0.05^{B}	3.87±0.07^{B}	4.12±0.10^{AB}	4.22±0.05^{A}	*
4-6 weeks	4.60±0.05^{B}	4.53±0.05^{B}	4.88 ±0.09^{AB}	4.89±0.12^{A}	*
0-6 weeks	3.93±0.03^{B}	3.86±0.03^{B}	4.06±0.17^{A}	4.14±0.06^{A}	*
Morality rate %					
0-6 weeks	3.97±0.48	3.95±0.55	4.54±0.67	4.47±0.68	ns

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

Feed intake and feed conversion ratio.

Feed intake (FI) values during the whole experimental period gradually decreased significantly (P< 0.05) with the increase of DSM levels as shown in Table 2. The FI of the group fed 20% DSM was significantly less than that the control group. It is clear that substitution of 20 % DSM decreased feed intake by 6.24 % than that of the control group at 6 weeks of age .

These relationships were defined by the following regression equations:

$$FI = 683.30\text{-}2.00\ X$$

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

Where: X = levels of date stone meal (DSM).

The decrease in FI may be due to the presence of tannins, which decrease palatability of feed. It may also be concluded that the 10% level had a better palatability than other treatments of DSM. *Makkar et al.* (1996) Indicated that tannins decrease palatability through precipitation of salivary protein. *Attalla and Harraz* (1996) recorded that date pits contained from 1.59 to 3.48 % tannins. In accordance with the present date *El- Bogdady* (1995)

found that of quail chicks fed 10 and 15% DSM consumed less feed than control group. *El-Kerdawy et al.* (1998) recorded a non-significant decrease in FI in rabbits fed 5, 10 and 15% DSM. *Abd El-Fattah* (1990) indicated that average FI of ducklings receiving DSM was lower than that of control group. In the same trend, *Radwan et al.* (1997) found that FI of chicken chicks decreased non-significantly with increasing DSM %.

Results of feed conversion ratio (FCR) (g feed/g gain) revealed a significant difference ($P<0.05$) among the experimental groups as shown in Table 2. It was observed in this study, that quail fed 10% DSM recorded the best FCR, on the contrary, 20% DSM level recorded the worst FCR. due to the decrease in feed intake and reduction of daily weight gain.

These relationships were defined by the following regression equations:

$$FCR = 3.87 + 0.01\ X$$

$$\hat{r} = 0.76,\ (p<0.05).$$

Where: X = levels of date stone meal (DSM).

In agreement with the present results, *El- Bogdady et al.* (1995) Found that the 10% DSM improved FCR of growing quail. *Abd El- Mageed* (1994) found that FCR decreased non-significantly in broiler after feeding 5, 10 or 15% DSM. In the same trend, *Abd El- Rahman et al.* (1999) noticed that using 13% DSM in feeding laying hens decreased FI and FCR significantly.

Mortality rate .

Results on mortality rate % recorded a non-significant difference between groups fed diets containing DSM and control group. Quail fed 10% DSM recorded the lowest , while, the 15% DSM level recorded the highest mortality rate %.

Digestibility and nutritive values of the experimental diets.

The digestion coefficients for levels of DSM as compared with control diet are present in Table (3) and Fig.(1). The digestibility of OM, CP and CF % showed a highly significant ($P<0.01$) decrease for diets containing DSM in comparison with control diet, the minimum decrease was noticed for 10% DSM and the maximum decrease was found for 20% DSM diet. On the other hand, a non-significant difference was observed in the digestibility of EE. In NFE digestibility, revealed a significant difference ($P<0.05$) among the experimental diets .

Regarding the nutritive values, it is clear that DCP, TDN % and ME (Kcal/Kg) were decreased significantly by increasing of DSM up to 20% . It is of great importance to noting that the results of the digestion trial were coincided generally with the differences in growth performance and feed conversion ratio in quail fed DSM.

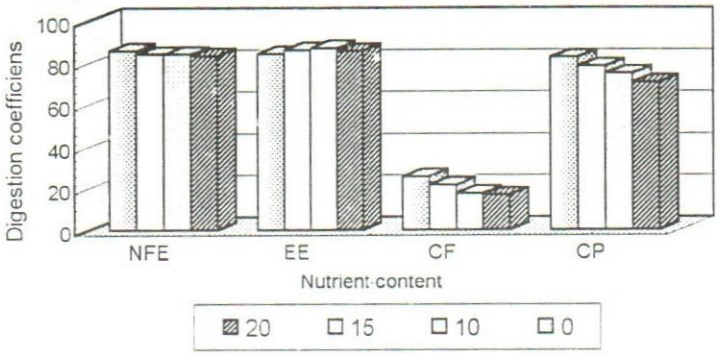
This result agreed with that of *Abd El-Mageed* (1993) who recorded a decrease in nutrient digestibility in feeding broiler . *El-Kerdawy et al.* (1998) recorded that using 15% DSM in feeding rabbits decreased significantly ($P < 0.01$) the digestibility of CP and NFE, while,digestibility of DM, OM, CF and EE was not-significant.

Table (3): **Effect of feeding different levels of date stone meal by growing quail on digestion coefficients and nutritive values(Mean±SE) of experimental diets.**

Items	Level of date stone meal				sig
	Control	10%	15%	20%	
OM	80.50±1.2^{A}	79.82±1.28^{A}	76.83±1.67^{AB}	72.46±2.1^{B}	**
CP	82.51±1.4^{A}	78.12±1.09^{AB}	74.62±2.16^{B}	70.52±2.7^{B}	**
CF	25.53±1.2^{A}	21.45±1.22^{AB}	17.35±1.63^{B}	16.63±1.9^{B}	**
EE	84.11±1.82	85.95±1.22	86.89±1.22	85.54±1.55	ns
NFE	85.62±1.1^{A}	84.03±0.82^{AB}	84.04±0.94^{AB}	83.29±1.3^{B}	*
Nutritive values					
DCP%	19.88±0.3^{A}	18.69±0.42^{A}	17.76± 0.30^{A}	16.75±0.5^{B}	
TDN%	67.85±1.2^{A}	64.13 ±2.01^{A}	63.59± 1.5^{AB}	61.96±1.1^{B}	**
ME (kcal/kg	2872±98.2^{A}	2712±99.1^{AB}	2688±88.57^{B}	2617±98.5^{B}	*

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

Fig.(1) Digestion coefficiens of experimental diets of quail fed diets containing defferent levels of DSM.



The decrease in digestibility of nutrients may be due to 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.

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. *Mc Donald et al.* (1996) reported that tannin molecules can form stable chelates with many metal ions such as zinc,

cupper and iron or reduce their solubility. Moreover, tannins can disturb the absorption of minerals through the gastrointestinal tract.

It is well known that crude fiber are non-starch polysaccharides (NSP) that include cellulose, hemi cellulose, pectin substances and beta glucose. This, however, may decrease the utilization of DSM in poultry feeding.

Regression equations of digestion coefficients as affected by different levels of DSM are shown in Table 4. It is of great importance to note that the results of the digestion trial were coincided generally with the differences in growth performance and feed conversion ratio in quail fed DSM.

Table (4): Regression equations of digestion coefficients as affected by feeding DSM diets.

Items	Regression equations	R^2	P
CP	83.08-0.59 X	0.97	**
CF	25.55 –0.47 X	0.96	**
EE	84.65+0.09 X	0.55	*
NFE	85.44- 0.13 X	0.88	*

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

Carcass traits and chemical analysis of meat.

Results on carcass trails of quail and chemical analysis of meat after feeding different levels of date stone meal are summarized in table (5). Data in the present study showed that DSM levels in diets decreased (P<0.05) dressing percentage with 20% DSM and non-significantly with 10 and 15% DSM compared with control.

Table (5): Carcass traits of slaughtered quail and chemical analysis of meat ($\bar{X}$ ± SE)as affected by feeding different levels of date stone meal

Criteria	Control	Levels of date stone meal			Sig.
		10 %	15 %	20 %	
Live body weight (g)	183.50±1.22^{A}	180.55±1.60^{A}	172.21±1.5^{B}	168.9±1.75^{B}	*
Dressing %	72.86±0.03^{A}	72.17±1.10^{A}	70.83±1.05^{AB}	69.1±1.28^{B}	*
Heart %	0.75±0.02	0.77±0.03	0.79±0.02	0.80±0.04	ns
Gizzard %	2.39±0.03	2.53±0.05	2.56±0.04	2.60±0.07	ns
Liver %	2.47±0.02	2.51±0.03	2.63±0.08	2.71±0.06	ns
Edible giblets* %	5.61±.1.10	5.81±0.09	5.98±0.12	6.11±0.14	ns
Moisture %	72.25± 0.39	72.24±0.24	72.35±0.15	72.43±0.14	ns
Protein %	22.21± 1.05	22.19±0.10	22.11±0.07	22.01±0.05	ns
Ether extract %	3.06± 0.60	3.16±0.20	3.20±0.11	3.20±0.10	ns
Ash %	1.33± 0.50	1.32±0.05	1.33±0.04	1.34±0.06	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.

The decrease in dressing percentage was due to the decrease in live body weight. This contrasts with the reports of *El- Bogdady et al.* (1995) who found that dressing percentage was not significantly affected by

incorporation of DSM up to 15% in diets of growing quail. *Soliman* (1996) found that carcass percentage was not significantly affected by incorporation of DSM in broiler diets while gizzand percentage increased with increasing DSM levels.

Economic efficiency .

The collective data showing the effect of different levels of DSM on feed cost, net return and economic efficiency (Ee)% as compared with the control group are presented in table (6) and Fig.(2). It is clear that the cost of kg feed decreased with increasing levels of DSM where 20% DSM recorded the lowest value versus the control diet. Data indicated that DSM increased Nr of experimental diets as compared with control, with the lowest level of DSM 10% recording the highest values.

The 10 % level showed the lowest feed cost of Kg meat due to the reduction of its FC.Thus, this level produced the highest net return and the highest economic efficiency compared with all DSM groups including the control.

Table (6): Economic evaluation of feeding different levels of date stone meal by growing quail.

Item	Control	Levels of date stone meal		
		10	15	20
Feed conversion ratio	3.93	3.86	4.06	4.14
Cost of Kg feed (LE)	1.46	1.40	1.36	1.35
Feed cost of kg meat (LE)	5.74	5.40	5.52	5.59
Market price of one Kg meat (LE.)	12.00	12.00	12.00	12.00
Net return (LE).	6.26	6.60	6.48	6.41
Economic efficiency % (Ee) of feed	109.06	122.22	117.17	114.67
Relative economic efficiency of feed	100	112.07	107.44	105.14

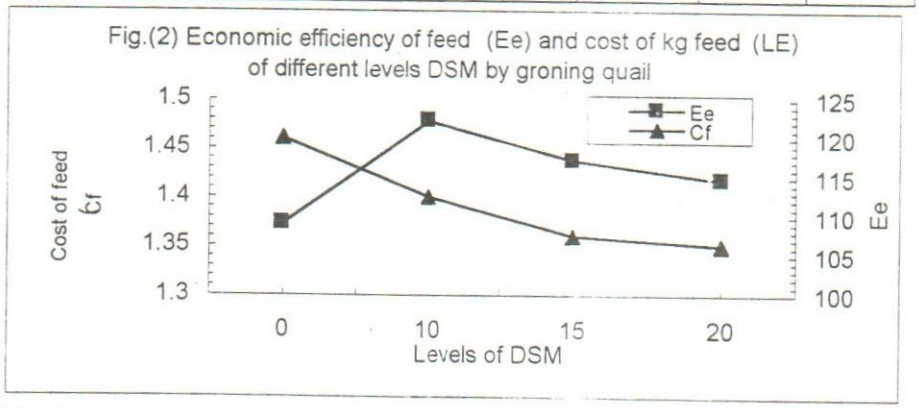


Fig.(2) Economic efficiency of feed (Ee) and cost of kg feed (LE) of different levels DSM by groning quail

biochemical parameters .

Serum, total protein (TP), albumin (AL), globulin (GL), A/G ratio, creatinine (Cr) and uric acid (Ur) recorded a non-significant difference between quail groups. (As shown in Table 7). Similar results were observed by *El-Kerdawy* (1998) in rabbits fed diets containing 5, 10 and 15% DSM.

Serum liver enzymes ,aspartate aminotransferase (AST) and alanine amino-transferase (ALT) recorded a gradual increase ($p<0.05$) with increasing DSM levels, this increase being significant only with 20% DSM, which may be due to the direct action of tannins on the liver. *Abd El- Mageed* (1993) noticed that serum AST and ALT after feeding broiler chicks on diets containing 5, 10 and 15% DSM.

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

Criteria	Control	10%	15%	20%	Sig
TP (g/100 ml)	3.59 ± 0.06	3.57±0.05	3.55±0.08	3.52±0.11	n.s.
Albumin (g/100 ml)	1.65±0.05	1.66±0.08	1.61±0.06	1.59±0.1	n.s
Globulin (g/100 ml)	1.94±0.03	1.91±0.05	1.94±0.03	1.93±0.09	n.s
A/G ratio	0.85±0.015	0.87±0.05	0.83±0.03	0.82±0.02	n.s
AST (u/ml)	29.33 ± 1.04^{B}	31.0 ± 0.9^{AB}	32.36 ± 0.95^{AB}	34.01 ± 1.24^{A}	*
ALT (u/ml)	7.33 ± 0.91^{B}	7.68 ± 0.8^{B}	8.51 ± 1.2^{AB}	9.65 ± 0.89^{A}	*
Creatimine mg/100ml)	0.85±0.02	0.85±0.04	0.82±0.03	0.79±0.05	n.s
Uric acid (mg/100ml)	1.55±0.05	1.57±0.09	1.63±0.09	1.63±0.12	n.s
Cholesterol (mg/100ml)	175.25 ± 2.19^{A}	170.12 ± 2.8^{AB}	165.21 ± 1.29^{B}	160.32 ± 2.01^{C}	*

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

The liver and kidney suffer serious damage from feeding tannins (Singleton, 1981 and *Gasg et al.* 1991). Tannins cause liver polyribosome disaggregation, inhibition of microsomal enzymes, inhibition of protein and nucleic acid synthesis, fibrosis, coagulation and necrosis in the liver cells (Singleton 1981). Moreover, *Garg et al.* (1991) reported that tannins increased activity of AST. In the present study a non-significant variation was observed in serum creatinine and uric acid between all groups. These results indicate that the incorporation of DSM in the diets of quail had no effect on kidney function. Serum cholesterol showed a significant decrease in quail fed 15 and 20% DSM in comparison with the control group, while, 10% level was nearly equal to the contrcl group.

El- Kerdawy et al. (1997) found that serum cholesterol of rabbits fed 5, 10 or 15% DSM recorded a non-significant difference between groups. *Abd El-Naby* (1999) concluded that total unsaturated fatty acids in date pit oil were 52.43- 55.38%, the predominant unsaturated fatty acid being oleic acid. *Hegested et al.* (1960) indicated that chicks suffered from hypercholesterolaemia after feeding diets containing saturated fatty acids, while unsaturated fatty acids decreased serum cholesterol.

In conclusion, from the nutritional and economical efficiency of stand points of view, up to 10% date stone meal could be recommended to be used successfully and safely in the formulated diet for growing quail without adversely affect their performance or physiological parameters.

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ألاستفاده من مسحوق نوى البلح في تغذية السمان النامي

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استخدم في هذا البحث عدد ١٨٠ كتكوت سمان ياباني من الفقس حتى عمر ٦ أسابيع. حيث هدفت الدراسة إلى الاستفادة من مسحوق نوى البلح كإحدى مخلفات التصنيع الغذائي في تغذية السمان 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 مسحوق نوى البلح ١٠ ، ١٥ و٢٠ % من مكونات العليقة .

العلائق المستخدمة متشابهة في نسبة البروتين الخام ٢٤% والطاقة الممثلة ٢٩٠٠ كيلو كالورى /كيلوجرام

ويمكن إيجاز أهم النتائج في النقاط التالية :

- أظهرت النتائج أن مسحوق نوى البلح يحتوى على نسبة مرتفعة من الألياف ١٠,٥٧%. بينما ينخفض المحتوى من البروتين ٧,٦٥ % .والطاقة الممثلة ٢٦٧٥ كيلو كالورى/كيلو جرام عليقة
- سجلت المعاملة التي غذيت على ١٠ % من مسحوق نوى البلح تحسنا معنويا (عند المستوى ٥ %) في كل من وزن الجسم ومعدل النمو مقارنة بباقي معاملات إضافة مسحوق نوى البلح .
- لوحظ انخفاض معدل استهلاك الغذاء خلال فترة التجربة انخفاضا معنويا (عند مستوى ٥%) وذلك بزيادة نسبة مسحوق نوى البلح في العليقه . وقد سجلت المعاملة المغذاة على ٢٠ % اقل تلك القيم ، بينما سجلت مجموعة المقارنة أعلى القيم خلال فترة التجربة .
- حققت المعاملة التي غذيت على ١٠ % من مسحوق نوى البلح افضل معدل تحويل غذائي خلال فترة التجربة مقارنة بباقي المعاملات .
- لم يكن هنالك تأثير معنوي لمستويات الإضافة لمسحوق نوى البلح على صفات الذبيحة حتى المستوى ١٥ % ،بينما سجلت المعاملة ٢٠ % انخفاضا معنويا (عند مستوى ٥ %).
- تحقق أعلى عائد اقتصادي عند مستوى ١٠ % من إضافة مسحوق نوى البلح خلال فترة التجربة مقارنة بباقي المعاملات .
- أظهرت معاملات الهضم الظاهرية انخفاضا معنويا (عند مستوى ١ %) لكلامن البروتين والألياف الخام. بينما انخفضت معنويا (عند مستوى ٥ %) معاملات هضم المستخلص الخالي من النتروجين. و لم تتأثر معنويا معاملات هضم مستخلص الأثير بمستويات الإضافة لمسحوق نوى البلح في العليقة.
- تم استنتاج معادلات خط الانحدار التي تمثل العلاقة بين نسبة إضافة مسحوق نوى البلح و استهلاك الغذاء ومعدل التحويل الغذائي ومعاملات الهضم لمستويات الإضافة لمسحوق نوى البلح في العليقة
- لم يكن هنالك تأثيرا معنويا على محتوى السيرم من البروتين الكلي والالبيومين و الجلوبيولين والكرياتنين وحمض اليوريك .
- ارتفع نشاط انزيم AST. ALT معنويا (عند المستوى ٥ %) عند إضافة ١٥،٢٠ % مسحوق نوى البلح في العليقة.
- انخفض مستوى السيرم من الكوليسترول انخفاضا معنويا (عند المستوى ٥ %) مع زيادة نسبة إضافة مسحوق نوى البلح.

يمكن التوصية من الوجهة الغذائية ، الفسيولوجيه والاقتصادية إمكانية استخدام مستوى ١٠ % من مسحوق نوى البلح في علائق السمان النامي دون تأثير سلبي على أداء النمو والقياسات الفسيولوجية .