Egyptian J. Anim. Prod. (2013) 50(2):103-109

EFFECT OF FEEDING DATE STONE MEAL SUPPLEMENTED WITH ALLZYME® ON PERFORMANCE OF GROWING NEW ZEALAND RABBITS

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SUMMARY

This experiment was carried out to study the effect of using 10 and 20% date stone meal in the diet without or with adding Allzyme® SSF (enzyme product contains: Phytase, Beta-glucanase, Celluase, Pectinase, Phytase, Fungal Protease and Xylanase) at a level 0.02 % (w/w) on growth performance and carcass traits of growing rabbits. Forty-five New Zealand White weaned rabbits, 42 days age, and 755g average body weight, were divided into 5 groups with three replicates (3 for each) in a growth trail lasted for 8-weeks. Each group was randomly fed one of the experimental pelleted diets which were, control diet (T1) without date stone meal, 10% date stone meal either without Allzyme® SSF (T2) or with 0.02% (w/w) Allzyme® SSF addition (T3) or 20% date stone meal either without Allzyme® SSF (T4) or with 0.02% (w/w) Allzyme® SSF (T5). The experimental diets were formulated to be approximately iso-nitrogenous (~17% CP) and isocaloric (~2700 Kcal ME /Kg diet).

Using date stone meal at level 10 or 20 % of the diet either without or with adding Allzyme® SSF insignificantly worsen feed conversion compared to the control group. While average body weight gain and feed intake significantly (P>0.05) decreased with rabbits groups fed T4 or T5 compared to the control group. Using date stone meal at level of 10 or 20 % with adding Allzyme® SSF, slightly improved digestibility coefficients of dry matter, crude fiber, ether extract and NFE compared to the other tested experimental groups. There were insignificant differences in both dressing%, giblets% and meat protein content among different experimental groups. The lowest moisture and ether extract content in meat carcass achieved with rabbits group fed T4.

In general, the results indicate that date stone meal can be incorporated in rabbit diets up to 20% without adverse rabbit performance and up to 10% with adding Allzyme® SSF to achieve good economical efficiency comparable to control group.

Keywords: Date stone meal, Allzyme® SSF, Growth, Performance, Digestion, Carcass traits

INTRODUCTION

The price of the main ingredients in poultry and rabbits diets is constantly growing. So, new unconventional local sources of low price ingredients need to be identified and validated. The feed cost of animal nutrition represents more than 70% of the total production cost. It is now urgent to look for alternative feedstuffs to compensate the high cost of the conventional feedstuffs. Rabbits are herbivores and consume high fiber diets. Useless the digestive strategy of rabbits for the utilization of fibrous diets was described by (Cheeke *et al*., 1982). Rabbits can separate fiber and non-fiber components and retain non-fiber components for fermentation in the cecum. Benefits of supplementing non-starch polysaccharides rich diets with exogenous enzymes are well documented. Date stone meal is abundant in Egypt and has already been considered as a source of energy in poultry feeding (Abd El-Rahman *et al*., 1999 and Khidr *et al.,* 2005). Few experiments were carried out on the use of date stone meal as an ingredient in feeding rabbits. Date stone is a cheap by-product of date fruits industry. It is produced in huge amount in Egypt about, 1.1 million tons and approximately 110000-165000 tons annually are the possible crop of date stone, but only those from manufactured date can be collected (Gaber *et al*., 2012). Therefore, Date stone meal could be used in rabbit diets. Especially, that the rabbits are herbivores and consume high fiber diets. Some experiments were carried out on the use of date stone meal as an ingredient in rabbits feeding. Most of these experiments showed that date stone meal can be included in the diet of growing rabbits up to 15% without any diverse effect on productive performance and economical efficiency. Date stone meal may be used in rabbit diets (Soliman *et al.*, 2009). The best rabbit's performance was by adding enzyme to the diets containing date stone meal (Ibrahim *et al.*, 2010). Enzyme mixture could support the endogenous enzymes of the poultry & rabbits (amylase and protease), break down some components of cell wall, which cannot be broken down into absorbable nutrients by endogenous enzymes (Tawfeek, 1996), lowering the gastrointestinal viscosity in digestive tract (Simon, 2000), reduced nutrient entrapment and releasing other nutrients like minerals (Al-Harthi *et al.*, 2009, Soliman *et al.*, 2009 and Ibrahim *et al.*, 2010).

This work aimed to study the effect of feeding 10 or 20% date stone meal as a replace of diet on growth performance and carcass traits of growing rabbits in interaction with enzyme supplementation.

MATERIALS AND METHODS

The experimental work of this study was carried out at the rabbit house belonging to Animal

Nutrition Unit, Animal Production Department, Faculty of Agriculture, Cairo University, during winter 2010. Forty-five New Zealand White weaned rabbits, 42 days age, and 755g average body weight, were divided into 5 groups with three replicates (3 for each) in a growth trial lasted for 8 weeks. Five pelleted experimental diets were formulated using linear programming, to be approximately iso-nitrogenous to cover the requirement of growing rabbits according to NRC (1977) and Cheeke (1987). Date palm stone was purchased, in air dried form, as residues of food industry from El-Wadi El-Gaded Governorate. It was processed according to (Al-Harthi *et al.*, 2009) by sun-drying for 72 hours and ground in a heavy-duty high rotation hammer mill to pass through 1 mm. mesh sieve, producing a fine powder suitable for chemical analysis before mixing to the diets. Each group was randomly fed one of the experimental pelleted diets (Table 1). Which were, control diet (T1) contained 0% date stone, 10% date stone meal either without Allzyme® SSF (T2) or with 0.02% (w/w) Allzyme® SSF addition (T3), 20% date stone meal either without Allzyme® SSF additions (T4) and with 0.02% (w/w) Allzyme® SSF (T5). Allzyme® SSF enzyme product was purchased from local market (International Free Trade Co., Cairo, Egypt). Each gram contains: Phytase (min.30 FAU/g), Beta-glucanase (min. 200 BGU/g), Celluase (min.10 CMC/g), Pectinase (min. 4000 AJDU/g), Phytase (300 SPU/g), Fungal Protease (min. 700 HUT/g), Xylanase (min. 100 XU/g) delivered from Aspergillus niger, (APVMA 2005). The rabbits were kept under the same managerial hygienic condition. Diets were offered to the rabbit's ad-libitum and fresh water was available all the time during the experimental period. Individual live body weight, feed intake and feed conversion ratio were recorded weekly. During the experimental period, the live body weight (g), weight gain (g), feed intake (g), feed conversion ratio (g feed / g gain) were weekly recorded.

Digestibility trial was carried out using four male rabbits from each experimental group at the last week of the experiment (14 weeks of age). The rabbits were housed in metabolic cages where feces and urine were collected separately for four consecutive days. Proximate analysis of the diets and feces were carried out according to the methods of A.O.A.C (1990). At the end of the experimental period (14 weeks of age), four rabbits were randomly taken from each group and fasted for 12 hours before slaughtering to determined carcass characteristics according to Blasco *et al.* (1993).

The economic efficiency (EEF) was calculated according to the following equation: EEF = Net revenue / total costs Where the total cost calculated by Egyptian pound (L.E) in the local market at the time of experiment. All data were subjected to analysis of variance using the general linear models (GLM) procedure of SAS (1994).

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

Where: μ= overall mean of Y_{ij}, T = effect of treatment, i = (1, 2…, etc) and e_{ij} = experimental error. Differences between means obtained upon statistical analysis were compared using Duncan multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Chemical composition

The chemical analysis and composition of the experimental diets and date stone meal used in the formulation are presented in (Table 2). Data concerning the chemical analysis of date stone meal are shown in (Table 2) revealed that date stone meal had lower content of crude protein and NFE. The values were being 6.0% and 69.1%, respectively. In adverse date stone meal had higher content of DE, CF, EE and Ash. The obtained values were 3468, 13.9 7.8 and 3.2, respectively. The obtained results are in agreement with those analyzed by Soliman *et al*. (2009) and Ibrahim *et al*. (2010) that they reported nearly same results. Growth performance

The effects of the experimental diets on average body weight gains, feed intake and feed conversion values of the growing male rabbits are shown in (Table 3). The results indicate that there were numerical but insignificant (P>0.05) differences among rabbits groups fed T1, T2 and T3 in average body weight (2103, 1858 and 1956 gm, respectively) and average body weight gain (1347, 1101 and 1200 gm, respectively). While, feeding rabbits on T4 or T5 significantly (P>0.05) decreased the average body weight and average body weight gain, compared to those fed T1. The recorded values were 1579 and 1690 *vs* 2103 gm and 826 and 933 vs 1347 gm, respectively. There was insignificant (P>0.05) increase in feed conversion ratio when rabbits were fed diets containing date stone meal T2, T3, T4 and T5 compared to the rabbits fed on control diet T1. Nevertheless, feeding rabbits on T3 or T5 insignificantly (P>0.05) improve the feed conversion ratio compared with those fed diets without enzyme T2 and T4.

Its worthy to note that adding Allzyme® SSF to diets containing 10 or 20% date stone meal (T3 and T5) insignificantly resulted in better feed conversion values compared to those groups fed these diets without Allzyme® SSF (T2 and T4).

This positive impact may be due to the beneficial role of Allzyme® SSF in improving the digestibility of date stones in the experimental diets. The obtained results are in partial agreement with those reported by Soliman *et al.* (2009) and Ibrahim *et al.* (2010) who found that diets contain date stone meal supplemented with enzymes improved growth performance of growing rabbits. The enhancement in body weight gain due to enzymes mixture supplementation was reported by Ibrahim *et al*. (2010) on growing rabbits and Gracia *et al*. (2003) and Lazaro *et al*. (2004) on broilers and Khidr *et al.* (2005) on turkey.

Generally, the feed conversion values were insignificantly better for the rabbits groups fed the control group diets or 10 or 20% date stone meal diets supplemented with Allzyme® SSF T1, T3 and T5), compared to the other groups without enzyme (T2 and T5).

Digestibility

Results in Table (4) represent the effect of different treatments on nutrient digestibilities. It could be noticed insignificant differences in DM, CP and CF digestibilities among the different tested treatments. Similarly, the same trend was noticed with ether extract digestibility except value of T3 which had higher (P>0.05) values than those recorded with T2 (66.18 vs 59.05%).

Generally, adding Allzyme® SSF to the rabbits diets containing 10 or 20% date stone meal (T3 and T5) resulted in numerical increases in the digestibilities of most nutrients compared to the other tested diets included the control. The reduction in digestion coefficients of the date stone meal experimental diets without enzyme could be attributed to the high level of non-starch polysaccharides (NSPs) like cellulose and pentosans (arabinoxlans and glucans). These observations are supported by Soliman *et al.* (2007).

Table 1. Ingredients and chemical analysis of the experimental diets

Ingredients (%):	Experimental diets				
	T1	T2	T3	T4	T5
Clover hay	30.00	30.00	29.97	32.00	31.97
Date stones meal	-------	10.00	10.00	20.00	20.00
Corn grains	23.53	15.00	15.00	5.00	5.00
Wheat bran	21.34	18.87	18.87	15.87	15.87
Soy bean meal (44% CP)	18.70	19.70	19.70	20.70	20.70
Molasses	3.00	3.00	3.00	3.00	3.00
Di Ca-Phosphate	2.27	2.27	2.27	2.27	2.27
NaCl	0.50	0.50	0.50	0.50	0.50
Vit & Min. Premix*	0.30	0.30	0.30	0.30	0.30
Lime stone	0.22	0.22	0.22	0.22	0.22
DL-Methionine	0.14	0.14	0.14	0.14	0.14
Allzyme® SSF	-	-	0.02	-	0.02
Total (KG)	100	100	100	100	100
Chemical analysis of the experimental diets					
CP%	17.49	17.44	17.42	17.38	17.35
CF%	11.60	12.60	12.59	14.13	14.00
EE%	2.44	2.86	2.83	3.25	3.20
DE(kcal/kg)**	2675	2699	2699	2702	2702

* Vitamin and mineral premix at 0.3% of diet supplies the following per kg of diet: Vit. A 1200 IU, ; 500.000 IU.T3; 0.67 mg Vit.K3;0.67 mg Vit B1; 2.0 mg Vit.B2; 0.67 mg Vit.B6; 0.0004 mg Vit.B12; 16.7 mg Pantothenic acid; 0.07 mg Biotin; 1.67 mg Folic acid; 400 mg Choline chloride; 22.3 mg Zn; 10 mg Mn; 25 mg Fe; 1.67 mg Cu; 0.25 mg I; 0.033 mg Se and 133.4 mg Mg.

Carcass characteristics

Carcass characteristics at 14 weeks of age are presented in (Table 5). The obtained results showed that replacing date stone meal at levels 10or 20% without or with Allzyme® SSF in the diets, led to insignificant differences in dressing% and giblets% of rabbits meat compared to the control While rabbit groups fed the control diet or T5 had higher (P>0.05) moisture content in their carcasses in comparison to that group fed T4. Besides, there were significant increases (P>0.05) in ether extract content with feeding rabbits on T1 or T5 compared to those groups fed T2 or T4 %, being 5.89 and 5.92 *vs.* 5.35 and 5.18 %. It worthy to note that replacing date stone meal at 10 and 20 % of the diet reduced the ether extract content in carcass

compared to the control group. These observations coincided with those reported by Onwudike (1986) and Brufau *et al*. (1991) on broilers and Fetuga *et al*. (1977) on pigs, who cited that replacement date stone meal in diet didn't significantly affect carcass traits.

Table 2. Chemical analysis of used ingredient and experimental diets and date stone

Item	Experimental diets					
	T1	T2	T3	T4	T5	Date stones meal
DM	88.32	87.35	87.31	86.38	86.34	89.3
OM	95.34	94.59	94.55	94.13	94.15	96.8
CP	17.43	17.10	17.12	16.52	16.59	6.0
DE**	2685	2699	2699	2702	2702	3468
CF	12.62	14.93	14.92	16.10	16.12	13.9
EE	3.56	4.12	4.11	4.92	4.91	7.8
Ash	4.66	5.41	5.45	5.87	5.85	3.2
NFE	61.73	58.44	58.40	56.59	56.53	69.1

** Calculated analysis

Table 3. Growth performance of New Zealand White rabbits as affected by different treatments from 6 to 14 weeks of age

Item	Experimental diets					MSE
	T1	T2	T3	T4	T5	
Initial body weight (gm)	756	757	756	753	758	17.5
Body weight at 14 weeks (gm)	2103^{a}	1858^{ab}	1956^{ab}	1579^{c}	1690^{bc}	125
Total body weight gain	1347^{a}	1101^{ab}	1200^{ab}	826^{c}	933^{bc}	206
Total feed intake	4127^{a}	3738^{ab}	3860^{ab}	3251^{c}	3429^{bc}	261
Feed conversion	3.06	3.40	3.22	3.94	3.68	0.55

a,b,c Means values in the same row bearing different letters differ significantly (P>0.05)

Table 4. Nutrient digestibility of New Zealand White rabbits as affected by different Treatments

Digestibility %	Experimental diets					MSE
	T1	T2	T3	T4	T5	
Dry matter (DM)	71.64	70.44	72.84	73.65	73.63	4.15
Crude protein (CP)	76.04	74.83	78.29	73.22	75.45	2.67
Crude Fiber (CF)	39.13	38.51	43.28	37.80	44.71	3.63
Ether extract (EE)	62.26^{ab}	59.05^{b}	66.18^{a}	60.37^{ab}	63.34^{ab}	3.05
Nitrogen free extract (NFE)	82.38^{a}	81.30^{b}	82.46^{a}	76.02^{b}	82.77^{a}	1.02

a,b,c Means values in the same row bearing different letters differ significantly (P>0.05)

Economic efficiency

Results in Table (6) show that the profitability of using date stone meal as a partial of the rabbit diets depends on the price of these feedstuffs, assuming that costs of other ingredients are constant. Therefore, the height relative economic efficiency of feeding diets at marketing age (14 weeks) was achieved with rabbits group fed T3 compared to the other tested experimental groups. Regardless the control diet adding Allzyme® SSF to the rabbit diets under each experimental tested date stone meal (10 or 20%) improved the economic efficiency. These results may notify that the total feed costs (LE) declined by the inclusion of date stone meal in the diets due to its low price, same

results reported by Belal and AL-Owafeir (2009) and Gaber *et al*. (2012).

CONCLUSION

Conclusively, according to the circumstances of this experiment, date stone meal can be incorporated in rabbit diets up to 20% without adverse rabbit performance and up to 10% with adding Allzyme® SSF to achieve good economical efficiency comparable to control group

ACKNOWLEDGMENT

Gratefully acknowledgment to International Free Trade Co., Cairo, Egypt for help us by offer the Allzyme® SSF as a gift.

Table 5. Carcass traits and chemical analysis of New Zealand White rabbits as affected by different treatments

Item	Experimental diets					MSE
	T1	T2	T3	T4	T5	
Dressing* %	56.15	52.72	54.57	51.63	51.34	4.05
Giblets %**	4.40	4.60	5.14	4.58	4.47	0.35
Chemical analysis of meat:						
Moisture %	72.23^{a}	71.04^{ab}	71.01^{ab}	70.08^{b}	71.72^{a}	0.80
Crude protein %	20.93	19.93	20.00	20.05	20.12	0.53
Ether extract %	5.89^{a}	5.35^{bc}	5.75^{ab}	5.18^{c}	5.92^{a}	0.25

a,b,c Means values in the same row bearing different letters differ significantly (P>0.05)
* Empty carcass (without head)
** Liver + Kidney + Heart.

Table 6. Economic efficiency of the experimental diets from 6 to 14 weeks of age

Item	Experimental diets				
	T1	T2	T3	T4	T5
Number of survival rabbits	9	9	9	8	9
Average feed intake/rabbit (Kg)	4.13	3.74	3.86	3.43	3.6
Total feed intake (Kg)	37.17	33.66	34.74	27.44	32.4
Price/Kg feed (L.E)	2.97	2.79	2.79	2.44	2.44
Total feed cost (L.E)	110.39	93.91	96.92	66.95	79.06
Average body weight gain (Kg)	1.35	1.1	1.2	0.83	0.93
Total meat yield (Kg)	12.15	9.9	10.8	6.64	8.37
Selling price (L.E)	498.15	405.9	442.8	272.24	343.17
Net revenue*	387.76	311.99	345.88	205.29	264.11
Economic Efficiency**	3.513	3.322	3.569	3.066	3.341
Relative economic efficiency ***	100	94.58	101.60	87.29	95.10

Selling price of 1 Kg = 41 L.E.
* Net revenue = Total revenue – total cost.
** Economical efficiency = Net revenue / total costs.
*** Relative to control group.

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تأثير التغذية علي مسحوق نوي البلح بإضافة المركب الإنزيمي Allzyme® علي أداء الأرانب النيوزيلاندي الأبيض النامية

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قسم الإنتاج الحيواني - كلية الزراعة - جامعة القاهرة

أجريت هذه التجربة لدراسة تأثير استخدام 10 أو 20٪ مسحوق نوي البلح في العليقة بدون أو مع إضافة المركب الإنزيمي SSF Allzyme® (يحتوي علي الإنزيمات التالية : Alpha-amylase و Beta-glucanase و Celluase و Pectinase و Phytase و Fungal Protease و Xylanase) بمستوى 0.02٪ (و / و) على أداء النمو وصفات الذبيحة في الأرانب النامية. حيث تم تقسيم خمس وأربعون أرنب نيوزيلاندي ابيض مفطوم عمر 42 يوما بمتوسط وزن 755 جرام تقريبا، وذلك في 5 مجموعات في كل مجموعة ثلاثة مكررات (3 أرانب في كل مكرر) واستمرت تجربة النمو لمدة 8 أسابيع. وتم تغذية كل مجموعة عشوائيا علي العلائق التجريبية التالية في صورة مصبعات، مجموعة (T1) عليقة كنترول بدون مسحوق نوي البلح و مجموعة (T2) عليقة تحتوي علي 10 ٪ مسحوق نوي البلح بدون إضافة إنزيم Allzyme® SSF أو مجموعة (T3) نفس العليقة مع إضافة 0.02٪ (وزن / وزن) إنزيم Allzyme® SSF ثم مجموعة (T4)20 ٪ مسحوق نوي البلح بدون إضافة إنزيم Allzyme® SSF أو مجموعة (T5) نفس العليقة مع 0.02٪ (وزن / وزن) إنزيم Allzyme® SSF. كانت العلائق المستخدمة في التجربة شبه متماثلة في محتوي البروتين الخام (17٪) ومحتوي الطاقة (2700 كيلو كالوري/ كجم عليقة).

وأظهرت النتائج أنه لم يكن هناك تأثير معنوي عند استخدام مسحوق نوي البلح بمستوى 10 أو 20٪ في العليقة إما بدون أو مع إضافة إنزيم Allzyme® SSF علي قيم معامل التحويل الغذائي مقارنة مع مجموعة الكنترول. بينما انخفض متوسط الزيادة في وزن الجسم ومعدل استهلاك العلف معنويا (P>0.05) بتغذية الأرانب علي المعاملات T4 و T5 (20% مسحوق نوي البلح) مقارنة بالكنترول. وقد تحسنت معاملات هضم المادة الجافة والألياف الخام ومستخلص الأثير والمستخلص الخالي من الأزوت تحسنا طفيفا باستخدام مسحوق نوي البلح بمستوى 10 أو 20٪ مع إضافة إنزيم Allzyme® SSF مقارنة مع المجموعات التجريبية الأخرى التي تم اختبارها. وكان هناك فروق غير معنوية في النسب المئوية للذبيحة الفارغة والأجزاء المأكولة ومحتوي اللحم من البروتين بين المجموعات التجريبية المختلفة. وقد حققت مجموعة الأرانب المغذاة علي المعاملة T4 (20 ٪ مسحوق نوي البلح بدون إضافة إنزيم Allzyme® SSF) أقل نسبة رطوبة ودهن في الذبيحة.

وبشكل عام ، فإن النتائج تشير إلى أن يمكن استخدام مسحوق نوي البلح في علائق الأرانب بمستوي يصل إلى 20٪ بدون تأثير سيء علي أداء الأرانب النامية واستخدام مسحوق نوي البلح حتي 10% مع اضافة إنزيم Allzyme® SSF لتحقيق أداء جيد للنمو وكفاءة اقتصادية مقارنة بالكنترول.