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EFFECT OF REPLACEMENT OF YELLOW CORN BY GROUND DATE STONE WITH OR WITHOUT KEMZYME ON PERFORMANCE OF GROWING MAIL RABBITS

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ABSTRACT

Forty-five New Zealand White weaned male rabbits of five weeks of age with nearly equal live body weights were randomly allotted to five groups with three replicates of 3 rabbits each. Five pelleted experimental diets were formulated to be approximately Iso-nitrogenous. Treatment diets were formulated by replacing 50 or 100% of yellow corn in the control one by ground date stone with or without Kemzyme (at a level of 0.5 kg/ton of rabbit feed). The results indicated that 50% replacement of yellow corn ground date stone (with or without Kemzyme) significantly ($P<0.05$) improved feed conversion efficiency of growing male rabbits during the experimental period. Replacing of yellow corn at ٥٠ or ١٠٠% by ground date stone with Kemzyme supplementation slightly improved digestibility coefficients of dry matter, crude protein, crude fiber, ether extract and NFE. Besides supplementation to the replaced ٥٠% ground date stone with Kemzyme improved digestibility coefficients ADF, NDF and TDN. Dressing percentage was significantly ($P<0.05$) higher with supplementing Kemzyme to ٥٠ or ١٠٠% ground date stone, compared to the other experimental groups. The obtained results indicated that ground date stone could be used on the site of yellow corn (50% substitution) either without or specially Kemzyme supplementation which showed best performance and economic efficiency.

In general, the results indicated that ground date stone could replace yellow corn in rabbits feed by 50% either with or without Kemzyme, to realize the best production and economic efficiency values.

Keywords: Ground date stone, Kemzyme, Growth, Performance, Digestion, Carcass traits.

INTRODUCTION

The prices of the main ingredients of feedstuffs used in formulating poultry and rabbits feed are spontaneous increases, besides most of them are imported. So it is of benefit to apply new unconventional local sources of low price. Rabbits are herbivores and consume high fiber diets. They are hind-gut fermenters and are capable of retaining small fiber particles for digestion (Ehrhein *et al.*, 1983). A higher intake of fibrous diet is achieved when nutrient requirements are met by digestibility of the non-fiber component (Hintz *et al.*, 1978). The digestive strategy of rabbits for the utilization of fibrous diets was described by Cheeke (1987). Rabbits can separate fiber and non-fiber components and retain non-fiber components for fermentation in the cecum. The ground date stone as a cheep by product of date fruits crop was purchased to be experimented in this study.

This work aimed to determine the effects on growing rabbits growth performance and carcass traits when replacing yellow corn content of the basal diet by ground date stone either partially (50 replacement) or totally 100%. Each replcement included two treatments, with or without Kemzyme supplementation.

MATERIAL AND METHODS

The experimental work of this study was carried out at Poultry Nutrition Farm, Animal Production Department, Faculty of Agriculture, Cairo University, during winter 2003.

Five pelleted experimental diets were formulated to be approximately iso-nitrogenous. The diets were formulated to cover the requirement of growing rabbits according to NRC (1977) and Cheeke (1987) but with replacement of yellow corn (٥٠ or ١٠٠ %) by date stone meal with or without Kemzyme at level of 0.5 kg /ton of rabbit feed (Table 1). Kemzyme compound is a multiple enzyme product. Each gram comprises of alpha amylase 400 unit, cellulase complex 400 unit, beta glucanase 1250 unit, protease 450 unit, lipase 100 million unit and xylanase 20000 unit.

Table (1). Ingredients and chemical analysis of the experimental diets

	Experimental diets				
	D1	D2	D3	D4	D5
Ingredients (%):					
Yellow corn	20	10	10	-	-
Ground date stone	0	10	10	20	20
Wheat bran	28	28	27.95	28	27.95
Soy bean meal (44% CP)	17	17	17	17	17
Clover hay	33.2	33.2	33.2	33.2	33.2
Methionine	0.1	0.1	0.1	0.1	0.1
Lime stone	1	1	1	1	1
Salt	0.4	0.4	0.4	0.4	0.4
Kemzyme	-	-	0.05	-	0.05
Vit & Min. Premix*	0.3	0.3	0.3	0.3	0.3

- **Vitamin and mineral premix at 0.3% of diet supplies the following per kg of diet: Vit. A 1200 IU, ; 500.000 IU.D3; 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.**

Forty-five New Zealand white weaned male rabbits of five weeks of age and having approximate equal live body weights were randomly allotted to five groups with three replicates of 3 rabbits each Table (2). Rabbits of each replicate were housed in separate cages and kept under the same managerial hygienic condition. Diets were offered to the rabbits *ad-libitum* and fresh water was available all the time during the experiment. Individual live body weight, feed intake and feed conversion ratio were recorded weekly. Digestibility trails were carried out using four male rabbits from each experimental group at the last week of the experiment. Rabbits for each group were housed in metabolism cages where feces and urine were

collected separately 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 experimental period (13 weeks of age), four rabbits were randomly taken from each group and fasted for 12 hours before slaughter according to Blasco *et al.*, (1993). The economical efficiency (EE) was calculated according to the following equation:

EE = (A-B/B) X 100.

Where A is selling price of obtained gains and B is the feeding cost for these gains in Egyptian pound (L.E). All data were subjected to analysis of variance using the general linear models (GLM) procedure of SAS (1994) and differences obtained upon statistical analysis were compared using Duncan multiple range test (Duncan, 1955).

Table (2): The experimental treatments of the study

Treatment	R*	Rabbits/R	Diets fed	Replacement	Kemzyme supplementation
T1	3	3	D1	No (control diet containing 20% yellow corn)	Without
T2	3	3	D2	Replacing (50%) of the yellow corn by ground date stone	Without
T3	3	3	D3	Replacing (50%) Of the yellow corn by ground date stone	With Kemzyme supplementation
T4	3	3	D4	Total replacing (100%) of the yellow corn by ground date stone	Without
T5	3	3	D5	Total replacing (100%) of the yellow corn by ground date stone	With Kemzyme supplementation

R* Replicates number

RESULTS AND DISCUSSION

The chemical analysis composition of the experimental diets and the ingredients used in its formulation is presented in Table (3).

Table (3): Chemical analysis of used ingredient and experimental diets

Item	Experimental treatments						
	T1	T2	T3	T4	T5	Yellow corn	Ground date stone
DM	75	73.6	76.1	68.63	76.9	89.0	89.3
OM	76	75.3	78.27	69.77	77.1	98.5	96.8
CP	79	78.2	81.82	76.49	78.8	9.3	6.0
CF	41	40.1	45.06	39.3	46.6	2.2	13.9
EE	64.99	61.62	69.10	63.00	66.12	4.4	7.8
Ash	24	24.7	21.73	30.23	22.9	1.5	3.2
NFE	86.11	84.98	86.20	79.43	86.52	82.6	69.0

The effects of the experimental diet on body weight, body weight gains, feed intake and feed conversion values of growing male rabbits during the experimental period (5-13 weeks of age) are shown in Table (4). The results indicated that feeding growing rabbits on diets containing 10% ground date stone (50% replacement of yellow corn content) and either supplemented or not with Kemzyme had significantly ($p<0.05$) improved both body weight gain and feed conversion efficiency compared to those fed the totally replacement of yellow corn by ground date stone diets. The obtained values were 1055, 888, 1300 and 685 gm for body weight gain and 2.80, 4.17, 3.18 and 4.98 for feed conversion efficiency, respectively. On the other hand, feeding growing rabbits on diets T3 and T4 supplemented with Kemzyme when contained ground date stone the two levels of substitution resulted in an improvement in feed conversion efficiency when compared to those fed diets without Kemzyme. The values were 3.18 and 2.80 for T2 and T3 respectively in which diets contained 10% ground date stone. However, the values were 4.98 and 4.17 for T44 and T5 respectively in which diets contained 20% ground date stone. The improvement in rabbits performance may be due to the benefit role of Kemzyme in improving the digestibility of experimental diets. The results here in were supported by those reported by Mukhametagoliev *et al.*, (1986), El-Katasha *et al.*, (1988) and Tawfeek (1996) who found that supplemented diets with Kemzyme improved growth performance of growing rabbits fed diets containing corn or barley grains.

Generally, the best feed conversion was recorded with rabbits group fed 50 % ground date stone diets Supplemented with Kemzyme, compared to the other experimental groups.

Table (4): Growth performance of New Zealand White rabbits as affected by replacing yellow corn with ground date stone with or without Kemzyme supplement during the growing period from 5 to 13 weeks of age.

Item	Experimental treatment					MSE
	T1	T2	T3	T4	T5	
Initial body weight (gm)	695	690	695	685	695	1.75
Body weight at 13 weeks (gm)	1845^{a}	1990^{a}	1750^{ab}	1370^{c}	1583^{bc}	64.62
Total body weight gain	1150^{a}	1300^{a}	1055^{ab}	685^{c}	888^{bc}	64.11
Total feed intake (gm)	3843^{ab}	4123^{a}	2875^{c}	3413^{bc}	3600^{ab}	135.59
Feed conversion	3.34^{bc}	3.17^{c}	2.73^{c}	4.98^{a}	4.05^{ab}	0.24

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

Digestibility and nutritive values:

Results in Table (5) showed that substitution of ٥٠% yellow corn by ground date stone in growing rabbits diets and supplemented with Kemzyme slightly increased the digestibility coefficients of DM, CP, EE, CF and NFE compared to the other experimental diets. Moreover, no significant differences were observed in ADF and NDF digestibilities among the experimental groups. Generally, the highest digestibility of all nutrients was

recorded with rabbits fed diets containing 10% ground date stone (50% replacing the yellow corn content) and supplemented with Kemzyme. These results were somewhat agreed with those obtained by Osman *et al.*, (1996) and Attia *et al.*, (1998) who found that supplementation pekine ducklings diets containing barley with multi-enzyme improved the digestibility of fat and protein. Besides, Aboul-Ela *et al.*, (1999) reported that DM, CP and EE digestibility slightly improved when growing New Zealand white rabbits fed date pits at a level of 5%, compared to those fed the control diet. They also noted that the nutrients digestibility significantly ($p<0.05$) decreased as date pits level increased up to 100%.

Table (5): Nutrient digestibility and nutritive value of New Zealand White rabbits as affected by replacing yellow corn with ground date stone with or without Kemzyme supplementation.

Item	Experimental treatments					MSE
	T1	T2	T3	T4	T5	
Digestibility						
Dry matter (DM)	74.84	73.58	76.1	68.63	76.92	1.26
Crude protein (CP)	79.46	78.18	81.82	76.49	78.84	1.01
Crude Fiber (CF)	40.7	40.05	45.06	39.3	46.56	1.71
Ether extract (EE)	64.99^{ab}	61.62^{b}	69.10^{a}	63.00^{ab}	66.12^{ab}	1
Nitrogen free extract (NFE)	86.11^{a}	84.98^{ab}	86.20^{a}	79.43^{b}	86.52^{a}	1
Acid detergent fiber (ADF)	57.59	54.21	59.57	43.15	51.79	2.47
Nutrant detergent fiber (NDF)	55.95	51.12	57.59	42.18	51.2	2.41
Nutritive value						
Digestible crude protein (DCP)	13.71	13.25	13.87	12.74	13.13	0.20
Total digestive nutrients (TDN)	72.61^{a}	71.08^{a}	74.55^{a}	66.00^{b}	71.99^{a}	0.97
Digestible energy (DE)	3195.0^{a}	3127.5^{a}	3280.1^{a}	2903.9^{b}	3167.6^{a}	42.76

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

Concerning the results of nutritive value of the experimental diets expressed as DCP, TDN or DE (kcal/kg), Table (5) showed that TDN and DE were decreased significantly ($p<0.05$) when the diets included 20% ground date stone (100% replacing the yellow corn content) and supplemented with Kemzyme, compared to the other experimental diets were not insignificant However, the differences in DCP among the experimental diets. Therefore, growing rabbits can tolerate ground date stone up to a level of 50 % in their diets without any adverse effects on digestibility coefficient of nutrients or efficient utilization of these diets.

The previous results obtained on nutrients digestibility and feeding value of the diets revealed that substitution of 50% yellow corn by ground date stone with Kemzyme in growing rabbits diets achieved the highest digestibility and nutritive value compared to the other experimental groups. The benefit gained by addition of enzyme may be due to the largely partial degradation of soluble beta-glucan in barley and corn diets, reducing the viscosity of intestinal contents and improving nutrient absorption (Hesselman and Aman 1986). In this respect Zatari and Ferket (1990) revealed that the hydrolytic action of enzyme as a mixture including glucanase, gulactosidase, proteinase and cellulase works synergistically to improve the nutritive value of a diet.

Carcass characteristics at 13 weeks of age are presented in Table (6). Dressing percentage of rabbits meat was significantly ($p<0.05$) higher with feeding on diets in which Kemzyme was supplemented and ground date stone replaced its content of yellow corn at 50% or 100%. However, giblets percentages of rabbits meat were insignificantly affected among the experimental groups. With regard to chemical analysis of meat, no significant differences were noticed in both crude protein and moisture percentage, while the ether extract percentage of meat was significantly lower when growing rabbits fed 20% date stone meal without Kemzyme, compared to those rabbits fed the other experimental diets. These results agreed with those reported by Toson *et al.*, (1995) who found that dressing percentage of rabbits fed on diets containing date stone meal up to 100% (without Kemzyme) was approximately to that of the control diet. Further studies carried out by Onwudike (1986) and Brufau (1991) on broilers and Fetuga *et al.*, (1977) on pigs, showed that replacement date stone meal in diets did not significantly affect carcass traits, while carcass fat was significantly reduced with increasing date stone meal.

Table (6): Carcass traits and chemical analysis of New Zealand White abbits as affected by replacing yellow corn with ground date stone with or without Kemzyme supplementation.

Item	Experimental diets					MSE
	T1	T2	T3	T4	T5	
Dressing %	53.83	53.52	59.62	54.97	59.01	1.16
Giblets %	4.42^{ab}	4.31^{ab}	4.23^{b}	4.44^{ab}	5.01^{a}	0.11
Chemical analysis of meat:						
Moisture %	74.25	73.87	75.46	74.21	74.17	0.27
Crude protein %	20.67	20.74	21.59	20.54	20.61	0.27
Ether extract %	5.65^{ab}	5.23^{bc}	6.01^{a}	5.05^{c}	5.83^{a}	0.12

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

Economical efficiency:

Results in Table (7) showed that the profitability of using ground date stone as a partial or complete substitution for yellow corn in rabbit diets depends on the price of these feedstuff, assuming that the other costs are constant. Therefore, the economic efficiency of feeding diets at marketing age (13 weeks) was only higher with replacing yellow corn by 10% ground date stone. Without Kemzyme compared to the other experimental diets.

Conclusively, the obtained results indicated that ground date stone can be used at the level of 10% in rabbit diets (replacing yellow corn at 50% level) either not supplemented or supplemented with Kemzyme for best performance and economic efficiency

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Table (7): Economic efficiency of the experiment treatments from 5 to 13 weeks of age.

	Experimental treatment				
	T1	T2	T3	T4	T5
Number of survival rabbits	9	9	9	8	9
Average feed intake/rabbit (Kg)	3.843	4.123	2.875	3.413	3.600
Total feed intake (Kg)	34.59	37.11	25.88	27.30	32.40
Price/Kg feed (L.E)	0.93	0.88	0.90	0.83	0.85
Total feed cost (L.E)	32.17	32.66	23.29	22.66	27.54
Average body weight gain (Kg)	1.150	1.300	1.055	0.685	0.888
Total meat yield (Kg)	10.35	11.70	9.50	5.48	7.99
Selling price * (L.E)	113.9	128.7	104.5	60.28	87.89
Economic Efficiency **	81.68	96.04	81.21	37.62	60.35
Relative economic efficiency ***	100	117.58	99.42	46.06	73.89

* **Selling price of 1 Kg = 11 L.E.**

** **Economic efficiency = Selling total meat yield - total feed cost**

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تـــأثير استبدال الذرة الصفراء بنوى البلح مع أو بدون إضافة الكيمزيم على أداء ذكور الأرانب النامية

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تم استخدام ٤٥ أرنب نيوزيلندى ذكر مفطوم عمر ٥ أسابيع متماثلة فى الوزن تقريبـــا ووزعـــت عشوائيا على ٥ مجا ميع لكل مجموعة ٣ مكررات وكل مكرر ٣ أرانب، وتم استخدام ٥ علائق متزنة فـــى البروتين. تم استبدال ٥٠% من الذرة الصفراء بمسحوق نوى البلح مـــع أو بـــدون إضافـــة الكيمزيـــم (٠,٥ كجم/طن علف).

أوضحت النتائج أن استبدال ٥٠% من الذرة الصفراء بمسحوق نوى البلح مع الكيمزيم أدى إلـــى تحسين معنوى فى معامل التحويل الغذائى مقارنة بالمعاملات التجريبية الأخرى. أدى استبدال الذرة الصفـــراء ٥٠% او ١٠٠% بمسحوق نوى البلح مع إضافة الكيمزيم إلى زيادة معاملات هضم المادة الجافة والـــبروتين الخام والألياف الخام ومستخلص الأثير والمستخلص الخالى من الأزوت كما أدى استبدال الـــذرة الصفـــراء بمسحوق نوى البلح بمستوى ٥٠% مع إضافة الكيمزيم إلى تحسن فى معاملات هضم ال ADF و NDF و المركبات المهضومة الكلية. كما أشارت النتائج إلى أن تغذية الأرانب النامية على علائق بـــها ١٠ و ٢٠% مسحوق نوى البلح (بديلا ل ٥٠% أو ١٠٠% ذرة صفراء) مع إضافة الكيمزيم إلى زيادة معنوية فى نســـبة التصافى.

وعموما فإن نتائج البحث تشير إلى أن مسحوق نوى البلح يمكن استخدامه بديلا للـــذرة الصفـــراء فى علائق الأرنب بمستوى استبدال ٥٠% بدون أو مع إضافة المستحضر الإنزيمى كيمزيم حيـــث أعطـــت أفضل أداء إنتاجى و كفاءة اقتصادية.