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THE INFLUENCE OF DATE WASTE MEAL SUPPLEMENTED WITH EITHER ENZYMES, PROBIOTICS OR THEIR COMBINATION ON BROILER PERFORMANCE

By

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Abstract: *A 35 days feeding trial, utilizing 480 unsexed seven day old broiler chicks was conducted to study the effects of five inclusion levels (0,7,14,21 and 28%) date waste meal (DWM), as a replacement of yellow corn without or with either enzymes, probiotics or their combination on productive performance, carcass yield and digestion coefficients of crude fiber and ash. Birds were randomly divided into 20 groups of 24 chicks each. Each group received one of the five experimental diets without or with one of studied feed additives containing equal ratio of calorie : protein (C/P) under the same managerial conditions. Results obtained during the entire period (35 days) were as follows:*

1- *The proximate analysis showed that dietary date waste contains substantial amount of nutrients indicating its feeding value as an ingredient in feeding broiler chicks and a promising sources of energy.*

2- *Dietary date waste may be used at a level up to 21% without adverse effects on live body weight and weight gain.*

3- *Supplemented diets with a mixture of enzymes and probiotics gave the heaviest LBW compared with the other studied treatments.*

4- *Replacing yellow corn by date waste meal up to 21 % had no deleterious effects on parameter of feed intake over all the studied growth period. Enzymes and probiotics mixtures supplementation gave statistically equal values in this respect.*

5- *Substitution of yellow corn by date waste meal without or with either enzymes, probiotics or their combination did not yield any deterioration on feed conversion ratio. Differences among*

treatments in this respect were insignificant, expect for those during the first period (7 days old).

6- *Carcass characteristics, breast %, thigh% and water holding capacity (WHC) were not significantly affected by the different experimental treatments of date waste meal. The opposite was true for feed additives addition in respect to thigh percentage. A different trend was observed for abdominal fat percentage where increasing dietary date waste up to 28% increased the abdominal fat % compared with the control group.*

7- *Increasing dietary date waste meal up to 28% significantly decreased the crude fiber digestibility, whereas that of ash was increased. Feed additives had a beneficial effect on crude fiber and ash digestibility.*

In conclusion, date waste meal could be included in broiler chicks diet up to 21% without any bad effects on the productive performance. In addition a 28% dietary date waste meal plus enzymes and probiotics mixture supplementation could be ideal for the achieving of optimum broiler performance.

INTRODUCTION

Poultry production in many countries including Saudi Arabia has become one of the biggest agricultural industries. Its improvement is one of the main objectives of both private and public sectors.

Prices of yellow corn are increasing because of the limited world supply. Thereby, many efforts to reduce its use in poultry diets without lowering bird performance would be appreciated. According to the published statistics of the Ministry of Agriculture and Water (2000), a considerable amount (20%) of produced dates is inedible and is not suitable for human consumption due to its poor quality. The earliest reports on the composition of date waste meal (DWM) were recorded by Kamel et al., (1981) who indicated that it contains 2.9% protein, 76.2% carbohydrate nitrogen-free extract, 2.4% crude fiber. Macro-elements such as calcium and phosphorus were represented by 0.76 and 0.52%, respectively. The most limited amino acids in date meal were methionine and lysine. Also Najib et al (1995) evaluated the chemical composition of date meal from 1 to 12 date cultivars grown in Saudi Arabia. The results showed that the average of protein ranged from 2.12 to 4.10 %, fat levels average ranged from 0.09 to 0.64% and the level of ash ranged from 1.74 to 2.50%. Unfortunately, the fractionation of crude fiber of DWM indicated the presence of 39.7, 50.6, 11.9, 26.9 and 7.8% for acid detergent fiber (ADF), neutral detergent fiber (NDF), hemi-cellulose, cellulose and lignin, respectively (Ahmed, 1997). So, there are accumulative evidences indicating that cell wall non-starch poly-saccharides NSP have anti-nutritional activity in many mono-gastric (Choct, 2004). Based on the recent biotechnology in feed additives, extensive work has been done to improve the utilization of unconventional feedstuffs as a tool for reducing the cost feed. Probiotics have been used as growth promoters to replace the widely used antibiotic and synthetic chemical feed supplements (Ziprin and Deloach, 1993). Also, changing the feed formulation to reduce the cost/ton of feed and the addition of enzymes mixture maintains performance similar to the control (Ghazalah et al., 2005). Therefore, the present study was undertaken to critically evaluate the date waste meal as a source of dietary energy for broiler chicks. Evaluation of the tested material supplemented with either enzymes, probiotics and their combination was also performed.

MATERIALS AND METHODS

The current experimental work was carried out at king Abdulaziz University, Faculty of Meteorology Environmental and Arid land Agriculture. Four hundred and eighty unsexed seven-day old broiler chicks were weighed individually and wing banded. Chicks were randomly and equally divided into twenty treatments of 24 chicks each. Each group contained three replicates of 8 chicks. Chicks were kept under the same management conditions during brooding. The brooding temperature was about 35°C in the first week of age and then was gradually reduced according to common brooding practices. Artificial lighting was provided about 23 hours daily during the whole experimental period. A 5 x 4 factorial design of treatment was used. So, 20 experimental diets were adjusted to be iso-nitrogenous and iso-caloric, using five dietary date wastes meal (0, 7, 14, 21 and 28%) without or with either enzyme (0.5g/kg), probiotics (0.5g/kg) and their combination by the same dosages. ***The enzymatic preparation supplement used was Optizyme-5 tail which is composed mainly of multienzyme systems containing protease, lipase, amylase, hemicellulase, cellulase, xylanase, β-gluconase, amylogluconase and pentosanase.*** The probiotics used in this study was " livesac"*. ***A product manufactured by M/S. Zeus Biotech Limited, Mysore.. Each kilogram Livesac contains Lactic acid bacteria 12000 million CFU/kg, live yeast cells 5000 billion CFU/kg and traces of enzymes Viz., Xylanase, Glucanase, Pectinase, Amylase, Cellulase, Protease, phytase and Galactosidases.***

Diets and water were offered to chicks *ad-libtium* throughout the experimental period. Diets contained adequate levels of nutrients as recommended by the National Research Council (NRC, 1994). The composition of the experimental diets is shown in Table (2). The body weight (BW) and feed intake (FI) were recorded at 7, 22 and 35 days of age. Body weight gain (BWG) and feed conversion values were calculated at the same time.

At the end of the feeding trial, five birds per treatment were randomly assigned to determine the digestibility coefficients of fiber and ash. Excreta were collected quantitatively for three days and was dried in the electric oven at 60°C over night. The proximate analysis of diets and excreta were carried out according to the A.O.A.C, (1996). Slaughtering was performed on a random sample of five birds from each treatment. Birds chosen were deprived from feed for 10 hours, individually weighed and killed by cutting the throat jugular vein with a sharp knife. The carcass, including the front and hind parts and abdominal fat, were weighed and the calculation was done on the basis of live body weight. The water holding capacity (WHC) was measured by following the Grau and Hamm method (1957) and Volovin and Merkolova, (1958). Analysis of variance was performed using SAS software computer program (SAS, 1985). In order to determine significant differences between all possible mean comparisons, Duncan's Multiple Range test (1955) was applied to the data.

RESULTS AND DISCUSSION

Date Waste Meal (DWM) Evaluation

Proximate analysis results of date waste meal (DWM) are shown in Table (1). Values were calculated on a dry matter as fed basis. Moisture content of the DWM was 10.05%, indicating the possibility of storing it for a long time without deleterious effects. DWM contains a substantial amount of nutrients that are considered valuable ingredients and promising energy source in poultry feeding. These results are in agreement with those of Kamel et al., (1981) which were obtained from Zahdi whole dates.The high content of fiber in DWM compared with that of yellow corn is a limiting factor in formulating poultry diets as reported by Jumah et al., (1973), Yeong et al., (1981), Sawaya et al., (1984) and El-Boushy & Van derpoel (1994).

Although DWM contains relatively less amount of ether extract (1.72 Vs. 3.8%) and nitrogen free extract (75.71 Vs. 84.35) than yellow corn, many researchers have investigated the possibility of using it to partly replace a portion of a diet, as an energy source, in poultry diet (Kamel et al., 1981, Najib et al., 1993, Radwan et al., 1997, Hameidan et al., 1993 and Al-

Homidan, 2003). Consequently, the carbohydrate content of dates enable: them to replace energy source ingredient in poultry rations.

Regarding the macro elements, it can be noticed that calcium an(total phosphorus of the tested material were much higher than those o yellow corn (0.02 and 0.28%, respectively). Data of amino acids compositio1 showed that DWM contained a reasonable amount of methionine and lysin(as essential amino acids. These results are consistent with those reported b: Nwokolo et al., (1976), On- wudikee, (1986a,b) and Al-Homidan (2003) wh(reported that the calculated critical sulfur containing essential amino acids especially lysine content of DWM showed nearly the same value (0.26%) a that of yellow corn (0.27%).

The metabolizable energy (ME) of DWM was calculated to be 357(kcal / kg on the basis of its chemical composition according to (Karpente and Clegg, 1956). This value records higher than that of yellow corn (337(kcal/kg) according to NRC, (1994). Al-Yousef (1985) reported that ME o Khudri date was estimated to be 2409 kcal /kg. The difference in ME valu(of date meal may be attributed to its varieties as well as chemical an(physical related characteristics. Sawaya et al., (1983) and Najib et al., (1995 reported that different values of the proximate composition of date meal ma: be due to the variety, stage of maturation of the fruits, agronomic condition of dates and the length of storage.

Live body weight (LBW):

Data in Tables (3 and 4) indicated insignificant differences in LBW among the experimental groups fed 0,7,14, 21 and 28% dietary DWM during the first 7 days growth period. This creates a suitable condition to appraise the effect of dietary treatments during the subsequent periods. Meanwhile, with feeding diets to age 22 and 35 days, differences were significantly reduced when birds were fed 28% dietary DWM compared with the other treatments. This finding agreed with that reported by Al-Hiti and Rous (1978), Pektov et al.,(1979) and AL-Homeidan et al., (2003). A possible explanation for this detractive growth performance may be due to the relatively high fiber content of date meal (5.7%) which reduced the digestibility and availability of its nutrients. This result is well correlated with that of Jumah et al., (1973), Yeong et al,. (1981), Sawaya et al., (1984) and El- Boushy & Vander Poel (1994). Also, Nwokolo et al., (1976) and Onwudikee, (1986a,b) reported that date meal contains lower levels of essential amino acids such as lysine, methionine, leucine and isoleucine. In support to the present results, Mohamoud (2005) reported that feeding date seed meal containing diet led to negative effects on the intestinal morphological properties which reduced the absorptive surface in the digestive tract and consequently decreased chickens performance.

Concerning enzymes and probiotics supplementation, results of Table (3) showed insignificant differences in LBW among the experimental groups. Meanwhile, supplemented diets with mixture of enzymes and probiotics gave the heaviest LBW at 35 days old compared with the other studied treatments. The beneficial effects of exogenous enzyme addition improved the growth performance of chicks, decreased viscosity and consequently reduced the anti-nutritional effect of NSP, leading to better performance (vander Klis et al., 1995 and Mathlouthi et al., 2003).

Live body weight gain (LBWG):

Throughout the starter period (7-22 days) as shown in Tables (5 and 6), LBWG was not significantly affected by feeding diets of 7, 14 and 21% date waste meal compared to the control group. While, increasing the tested dietary DWM up to 28% recorded the lowest LBWG value. At the second growth period (22-35 days), substitution of yellow corn by date waste meal did not yield any deterioration in LBWG and the differences among the experimental groups were insignificant compared with the control group. The same trend was observed during the overall period (7-35 days) with date waste meal (7, 14 and 21%). Increasing the tested material up to 28% significantly reduced LBWG. This decrement may be attributed to the decline in the availability of the nutrients at high levels of the studied meal.

Feed additives supplementation resulted in no significant differences in LBWG among the experimental groups. However, the supplementation of enzymes and probiotics mixtures to the experimental diets gave better growth during periods of 22-35 and 7-35 days old. The beneficial effect of feed additives in improving LBWG of broiler was associated with the improvement in protein, fat and carbohydrate digestibilities (Ritz et al., 1995, Danicke et al., 1999, Nahas and Lefrancois, 2001 and He et al., 2003)

Feed intake (FI):

As shown in tables (7 and 8), inclusion levels of date waste meal (7,14 and 21%) resulted in a significant increase in feed intake values (FI) by about 5.92, 5.59 and 7.34% over that of the control. Increasing dietary date waste up to 28% in the experimental diet did not exhibit any significant increase for FI compared to the control during the period 7-22 days old. With feeding during 22-35 days, FI was significantly decreased by about 4.68, 0.58 and 7.70% than that of the control group for treatments of 14, 21 and 28% of the tested material during period of 22-35 days old. this may be attributed to the un-palatability of the diet as a result of increasing fiber content. In this regard, Jumah et al., (1973) found that high level of fiber in broiler diets decreased the passage of ingesta in the gastrointestinal tract, resulting in decreased feed intake. During the overall period of 7- 35 days, extremely FI represented similar trends as that of the second period (22-35 days) where feeding diet contained 7 % tested material gave significant the highest value. The opposite was true with 28% date waste meal where the chicks significantly consumed less feed than those at the other treatments.

Data in Table (7) showed that supplementation diets with enzymes significantly decreased FI during the periods (7-22) and (7- 35) days. The data are in accordance with those of Shakmak (2003) who found that avizyme addition to Japanese quail diet significantly decreased feed intake compared to the control group. Birds fed diets with a mixture of enzymes and probiotics supplementation recorded the highest value of FI. The interaction between dietary levels of date waste meal without or with either enzymes, probiotics or their combination was significant.

Feed conversion (FC):

The current results of feed conversion during the whole studied period (7-35 days) revealed that substitution of yellow corn by date waste meal did not yield any deteriorations where the differences among treatments were insignificant (Tables 9 and 10). A similar trend was observed during the second growth period (22-35 days). The opposite was true throughout the period of (7-22 days) which revealed that increasing dietary date waste up to 21 and 28% recorded the lowest FC value compared with that of the control group and those received inclusion levels of dietary DWM (7 and 14%).

The influence of enzymes and probiotics supplementation on the parameter of broiler FC are presented in Tables 9 and 10. It is clear that supplemented diets with either enzymes, probiotics or their combination did not give any significant differences. However, Cowan and Hastrup (1997) and Hong et al., (2002) reported that enzymes improved feed conversion. As well as, those of Parova et al., (1994) and Weis et al., (1997) and Shibi Thomas et al., (2005) who observed an improvement in FC with probiotics supplementation in duck diet.

Carcass characteristics:

The presented results in Tables 11 and 12 showed insignificant variations for breast %, thigh % and water holding capacity among the experimental treatments as compared with those of the control. A different trend was seen with abdominal fat percentage which showed that increasing dietary date waste up to 28% increased the abdominal fat %. It may be related to the finding of Crespo and Esteva-Garcia. (2001) who reported that abdominal fat content could be influenced by the fatty acid profile of diet.

Digestibility coefficients:

Digestion coefficients of crude fiber and ash of the experimental diets are shown in Tables 13 and 14. Results revealed that increasing date waste meal levels up to 28% decreased the digestion coefficient value of crude fiber. The opposite was true with that of ash which was significantly improved by about 6.73% over that of the control. Meanwhile, supplemented diet with a mixture of enzymes and probiotics significantly improved both crude fiber and ash digestibility coefficients by about 17.19 and 9.36% over that of the control, respectively.

With reference to body weight gain, it could be concluded that date waste meal could satisfactorily be utilized up to 21% of broiler diet without any decline effects on the productive performance. In addition, a 28% dietary date waste meal plus enzymes and probiotics mixture could be ideal for the achievement of optimum performance.

Table (1): Proximate analysis of date waste meal (on as fed basis).

Item	%
Moisture	10.05
Crude protein	3.9
Ether extract	1.72
Crude fiber	5.7
Nitrogen free extract	75.71
Ash	2.92
Calcium	0.62
Phosphorus	0.54
Methionine	0.07
Lysine	0.21
ME (kcal/kg)	3570

The metabolizable energy of date waste meal was calculated on the basis of its chemical composition according to the equation of Carpenter and Clegg. 1956 as follows:
ME (kcal/kg) = 35.3 (CP%) + 79.5 (EE%) + 40.9 (NFE%) + 199.

Table(2): Composition and calculated analysis of the experimental diets.

Ingredient	Control	7	14	21	28
Yellow corn	64.52	55.62	46.72	37.82	30.8
Soybean meal (48%)	32.28	33.18	34.08	34.98	35.0
Vegetable oil	-	1.0	1.75	2.50	3.0
Date waste meal	-	7.0	14.0	21.0	28.0
Limestone	0.8	0.8	0.8	0.8	0.8
Di-calcium phosphate	1.6	1.6	1.6	1.6	1.6
Vit+Min, premix*	0.3	0.3	0.3	0.3	0.3
Salt (Iodized)	0.3	0.3	0.3	0.3	0.3
DL-methionine	0.2	0.2	0.2	0.2	0.2
Sand	-	-	0.25	0.50	-
Total	100	100	100	100	100
Calculated analysis					
CP, %	20.97	20.93	20.88	20.82	20.52
ME, (Kcal/kg)	2894.16	2912.20	2907.87	2903.53	2889.86
C/P, ratio	138.01	139.14	139.27	139.46	140.8
Crude fiber	3.23	3.23	3.77	4.05	4.29
Ca (%)	0.88	0.88	0.88	0.88	0.88
Available P (%)	0.439	0.439	0.439	0.439	0.439

*Vit-Min. Premix provides per kilogram of diet: Vitamin A, 12,000 IU; Vitamin E, 20IU; menadione, 1.3 mg; vit D_3, 255 ICU; riboflavin, 5.5 mg; Ca pantothenate, 12 mg; nicotinic acid 50 mg; choline chloride, 600 mg; vitamin B12, 10 ug; vitamin B6, 3 mg; thiamine, 3 mg; folic acid, 1.00 mg; d-biotin, 0.50 mg. trace minerals (milligrams per kilogram of diet); Mn, 80; Zn, 60; Fe, 35; Cu, 8; Se, 0.60.

Table (3): The main effect of inclusion levels of date waste meal supplemented with either enzymes, probiotic or their combination on body weight at different ages.

Experimental treatments	Body weight (g) at		
	7 d.	22 d.	35 d.
Date levels, %			
0	210.50±0.14	860.7±11.71[ab]	1830.23±28.62[a]
7	209.25±0.10	870.59±9.55[a]	1866.09±22.66[a]
14	210.25±0.19	859.07±10.71[ab]	1796.88±28.14[a]
21	209.75±0.16	834.44±8.68[b]	1840.61±26.11[a]
28	211.03±0.20	792.94±10.70[c],	1684.03±25.76[b]
Additives			
None	209.0±0.14	844.83±9.62	1803.38±24.32
Enzyme,	210.80±0.13	839.40±8.98	1805.69±22.73
Probiotic	211.20±0.08	846.73±10.64	1796.0±27.53
Enzymes & probiotic	209.60±0.14	844.34±9.51	1812.13±23.42
SEM	0.073	9.929	11.738
Significance			
Date levels (D)	NS	**	**
Additives (A)	NS	NS	NS
DxA	NS	NS	NS

a,b,c... Means of the same column with different superscripts are significantly different

* = (P≤0.05) ** = (P≤0.01); NS = non significant

Table (4): The effect of interaction between inclusion levels of date waste meal and either enzymes, probiotics or their combination addition on body weight at different ages.

Date levels, %	Additives	Body weight (g), at		
		7 d.	22 d.	35 d.
0	None	211.0±0	858.0±19.67	1769.38±54.29
	Enzyme,	210.0±0	861.63±22.27	1843.44±53.82
	Probiotic	212.0±0	870.88±27.35	1865.63±58.03
	Enzymes & probiotic	209±0	852.56±25.74	1842.50±64.78
7	None	208.0±0	879.38±16.49	1895.0±43.94
	Enzyme,	210.0±0	859.81±12.98	1827.50±40.55
	Probiotic	210.0±0	888.13±28.35	1888.0±60.59
	Enzymes & probiotic	209.0±0	855.06±15.39	1856.88±34.61
14	None	208.0±0	855.0±24.12	1881.88±46.45
	Enzyme,	210.0±0	858.06±20.46	1795.63±53.52
	Probiotic	211.0±0	846.0±18.80	1708.75±60.53
	Enzymes & probiotic	212.0±0	877.25±23.22	1801.25±60.09
21	None	208.22±0.15	821.67±21.03	1778.33±53.19
	Enzyme,	211.0±0	833.75±16.37	1881.88±49.01
	Probiotic	211.0±0	842.19±17.17	1874.38±62.40
	Enzymes & probiotic	209.0±0	841.75±14.16	1835.63±42.29
28	None	210.0±0	808.43±23.48	1680.0±62.34
	Enzyme,	213.0± 0	783.75±21.97	1685.0±48.07
	Probiotic	212.0±0	786.44±19.61	1646.25±45.72
	Enzymes & probiotic	209.0±0	795.06±22.25	1724.38±53.87

Table (5): The main effect of inclusion levels of date waste meal supplemented with either enzymes, probiotic or their combination on body weight gain at different ages.

Experimental Treatments	Body weight gain (g)/ d., at		
	7 -22d.	22-35 d.	7-35 d.
Date levels, %			
0	43.31±0.78[ab]	74.58±2.4[ab]	57.86±1.02[a]
7	44.16±0.64[a]	76.56±1.86[a]	59.25±1.80[a]
14	43.25±0.72[ab]	72.19±2.20[ab]	56.70±1.01[a]
21	41.64±0.59[b]	77.36±2.14[a]	58.24±0.93[a]
28	38.84±0.72[c]	68.50±2.15[b]	52.63±0.93[b]
Additives			
None	42.43±0.66	73.71±1.98	56.99±0.87
Enzyme,	41.86±0.61	74.41±1.78	57.03±0.81
Probiotic	42.40±0.71	73.03±2.21	56.64±0.98
Enzymes & probiotic	42.34±0.64	74.43±1.83	57.24±0.84
SEM	13.30	23.58	13.30
Significance			
Date levels (D)	**	*	**
Additives (A)	NS	NS	NS
DxA	NS	NS	NS

a,b,... Means of the same column with different superscripts are significantly different

* = (P≤0.05) ** = (P≤0.01); NS = non significant

Table (6): The effect of interaction between inclusion levels of date waste meal and either enzymes, probiotics or their combination addition on body weight gain at different age.

Date levels, %	Additives	Body weight (g)/ d., at		
		7 -22d	22-35 d	7-35 d
0	None	43.25±1.29	70.06±4.47	55.69±1.96
	Enzyme,	73.31±1.49	75.56±4.05	58.38±1.91
	Probiotic	43.81±1.84	76.50±5.00	59.13±2.06
	Enzymes & probiotic	42.87±1.72	76.19±5.80	58.25±2.34
7	None	44.75±1.14	78.00±3.73	60.38±1.55
	Enzyme,	43.38±0.89	74.44±2.90	57.81±1.44
	Probiotic	45.31±1.89	76.81±5.12	59.94±2.17
	Enzymes & probiotic	43.19±1.01	77.00±2.96	58.88±1.24
14	None	43.13±1.62	79.06±4.17	59.81±1.65
	Enzyme,	43.19±1.38	72.06±4.66	56.63±1.92
	Probiotic	42.38±1.27	66.44±4.68	53.44±2.16
	Enzymes & probiotic	44.31±1.56	71.19±3.87	56.94±2.15
21	None	40.89±1.43	73.56±4.29	56.11±1.90
	Enzyme,	41.44±1.08	80.63±3.95	59.69±1.76
	Probiotic	42.13±1.17	79.38±5.41	59.44±2.21
	Enzymes & probiotic	42.19±0.98	76.38±3.33	58.00±1.52
28	None	40.00±1.54	64.07±5.35	52.50±2.25
	Enzyme,	38.00±1.48	69.38±4.04	52.63±1.72
	Probiotic	38.38±1.31	69.38±4.04	52.63±1.72
	Enzymes & probiotic	39.13±1.49	71.38±4.22	54.13±1.93

Table (7): The main effect of inclusion levels of date waste meal supplemented with either enzymes, probiotic or their combination on feed intake at different ages.

Experimental Treatments	Feed intake (g)/d., at		(g) / period
	7 -22d	22-35 d	7-35 d
Date levels, %			
0	76.00±0.15^{b}	155.00±0.70^{b}	3155±10.47^{c}
7	80.50±0.11^{a}	159.00±0.42^{a}	3275.50±5.98^{a}
14	80.25±0.11^{a}	147.75±0.61^{c}	3122.50±7.07^{d}
21	81.58±0.16^{a}	154.1±0.52^{b}	3226.36±7.45^{b}
28	77.55±0.14^{b}	143.06±0.63^{d}	3022±8.13^{e}
Additives			
None	79.00±0.34^{a}	152.80±0.47	3176.80±9.54^{a}
Enzyme,	78.40±0.22^{b}	151.00±0.38	3144.20±7.18^{b}
Probiotic	79.60±0.22^{a}	151.80±1.09	3165.40±13.92^{a}
Enzymes & probiotic	79.80±0.22^{a}	151.80±1.05	3168.80±15.58^{a}
SEM	0.6804	0.0569	0.2922
Significance			
Date levels (D)	**	**	**
Additives (A)	**	NS	**
DxA	**	**	**

a,b,... Means of the same column with different superscripts are significantly different

** = (P≤0.01); NS = non signific

Table (8): The effect of interaction between inclusion levels of date waste meal and either enzymes, probiotics or their combination addition on feed intakeat different ages.

Date levels, %	Additives	Body weight (g) /d. 7 -22d	Body weight (g) /d. 22-35 d	Body weight (g)/period 7-35 d
0	None	75.0±0.00	150.0±0.0	376.0±0.0(
	Enzyme,	75.0±0.00	149.0±0.00	3068.0±0.0
	Probiotic	76.0±0.00	161.0±0.00	3234.0±0.(
	Enzymes & probiotic	78.0±0.00	160.0±0.00	3242.0±0.0
7	None	81.0±0.00	160.0±0.0	3293.0±0.(
	Enzyme,	79.0±0.00	156.0±0.00	3220.0±0.0
	Probiotic	81.0±0.00	164.0±0.00	3344.0±0.0
	Enzymes & probiotic	81.0±0.00	156.0±0.00	3245.0±0.0
14	None	80.0±0.00	155.0±0.00	3210.0±0.0
	Enzyme,	79.0±0.00	149.0±0.00	3122.0±0.0
	Probiotic	81.0±0.00	142.0±0.00	3055.0±0.0
	Enzymes & probiotic	81.0±0.00	145.0±0.00	3103.0±0.0
21	None	82.22±0.53	149.88±0.076	3176.76±9.1
	Enzyme,	81.0±0.00	154.0±0.00	3219.0±0.0
	Probiotic	81.0±0.00	152.0±0.00	3193.0±0.0
	Enzymes & probiotic	52.0±0.00	161.0±0.00	3123.0±0.0
28	None	76.0±.00	149.0±0.00	3070.0±0.(
	Enzyme,	78.0±0.0	147.0±0.0	3001±0.0
	Probiotic	79.0±0.0	140.0±0.0	3001±0.0
	Enzymes & probiotic	77.0±0.0	137.0±0.0	2931.0±0.(

Table (9): The main effect of inclusion levels of date waste meal supplemented with either enzymes, probiotic or their combination on feed conversion at different ages.

Experimental Treatments	Feed conversion , at		
	7 -22d	22-35 d	7-35 d
Date levels, %			
0	1.79±0.03[b]	2.23±0.07	1.99±0.04
7	1.58±0.03[b]	2.16±0.06	2.00±0.03
14	1.88±0.03[b]	2.21±0.09	2.01±0.04
21	1.98±0.03[a]	2.10±0.07	2.01±0.04
28	2.03±0.04[a]	2.24±0.09	2.09±0.04
Additives			
None	1.89±0.03	2.22±0.08	2.03±0.03
Enzyme,	1.91±0.03	2.14±0.05	2.00±0.03
Probiotic	1.91±0.03	2.26±0.09	2.04±0.04
Enzymes & probiotic	1.92±0.03	2.14±0.06	2.01±0.03
SEM	14.109	29.37	14.04
Significance			
Date levels (D)	**	NS	NS
Additives (A)	NS	NS	NS
DXA	NS	NS	NS

a,b,... Means of the same column with different superscripts are significantly different

** = (P≤0.01); NS = non significant

Table (10): The effect of interaction between inclusion levels of date waste meal and either enzymes, probiotics or their combination addition on feed conversion at different ages.

Date levels, %	Additives	Feed conversion , at		
		7 -22d	22-35 d	7-35 d
0	None	1.75±0.05	2.27±0.14	2.01±0.07
	Enzyme,	1.76±0.06	2.09±0.11	1.941±007
	Probiotic	1.78±0.07	2.25±0.14	1.99±0.07
	Enzymes & probiotic	1.86±0.07	2.31±0.19	2.04±0.08
7	None	1.81±0.05	2.12±0.09	1.98±0.05
	Enzyme,	1.84±0.04	2.16±0.09	2.01±0.06
	Probiotic	1.84±0.09	2.31±0.17	2.04±0.08
	Enzymes & probiotic	1.91±0.04	2.05±0.08	1.98±0.04
14	None	1.89±0.07	2.06±0.13	1.96±0.06
	Enzyme,	1.84±0.13	2.24±0.16	2.01±0.07
	Probiotic	1.93±0.01	2.41±0.30	2.09±0.09
	Enzymes & probiotic	1.86±0.08	2.14±0.13	1.99±0.07
21	None	2.03±0.07	2.16±0.13	2.06±0.07
	Enzyme,	1.99±0.05	1.98±0.09	1.96±0.06
	Probiotic	1.94±0.06	2.12±0.21	1.96±0.09
	Enzymes & probiotic	1.96±0.04	2.16±0.09	2.07±0.05
28	None	1.93±0.08	2.52±0.35	2.14±0.011
	Enzyme,	2.09±0.08	2.22±0.12	2.11±0.06
	Probiotic	2.08±0.07	2.23±0.12	2.12±0.06
	Enzymes & probiotic	2.01±0.09	2.03±0.13	1.97±0.07

Table (11): The main effect of inclusion levels of date waste meal supplemented with enzymes, probiotic or their combination on some carcass characteristic.

Experimental Treatments	Live body weight %)	Dressing (%)	Breast (%)	Thigh, (%)	Abdominal fat (%)	Water holding capacity
Date levels, %						
0	2208.50±27.98[bc]	64.55±0.52[ab]	52.57±0.32	46.41±0.34	1.03±0.07[b]	85.14
7	2274.65±28.18[ab]	64.15±0.36[ab]	52.61±0.50	46.16±0.49	1.26±0.13[ab]	84.16
14	2298.25±23.78[a]	64.35±0.33[ab]	52.11±0.41	46.70±0.43	1.21±0.11[ab]	83.68
21	2184.50±32.77[c]	65.25±1.06[a]	51.44±0.35	47.33±0.36	1.24±0.08[ab]	83.51
28	2188.00±25.42[c]	63.75±0.35[b]	51.43±0.48	47.17±0.43	1.39±0.09[a]	83.97
Additives						
None	2289.60±25.15[a]	64.16±0.30[b]	51.53±0.42	47.48±0.42[a]	1.16±0.08[ab]	83.42
Enzyme,	2210.12±29.99[b]	65.40±0.72[a]	52.09±0.41	46.85±0.43[ab]	1.06±0.07[b]	83.52
Probiotic	2198.40±22.57[b]	63.60±0.61[b]	52.20±0.33	46.47±0.32[ab]	1.33±0.08[a]	83.46
Enzymes & probiotic	2225.00±23.71[b]	64.48±0.35[ab]	52.44±0.35	46.22±0.31[b]	1.35±0.11[a]	83.11
SEM	4.89	2.75	3.53	3.93	0.88	0.78
Significant						
Date levels (D)	**	**	NS	NS	*	NS
Additives (A)	*	**	NS	*	*	NS
DxA	**	**	NS	NS	NS	NS

a,b,c... Means of the same column with different superscripts are significantly different

** = (P≤0.01); NS = non significant

Table (12): The effect of interaction between inclusion levels of date waste meal and either enzymes, probiotics or their combination addition on some carcass characteristic.

Date levels, (%)	Additives	Live body weight %)	Dressing (%)	Breast (%)	Thigh, (%)	Abdominal fat(%)	Water holding capacity
0	None	2262±59.02	63.60±1.08	52.4±0.89	46.76±1.02	0.84±0.18	85.14
	Enzyme,	2268±70.24	65.00±1.18	52.48±0.55	46.38±0.50	1.14±0.11	84.16
	Probiotic	2178±18.55	65.40±1.29	53.14±0.92	45.96±0.88	0.90±0.11	83.68
	Enzyme & probiotic	2126±50.75	64.20±0.73	52.24±0.25	46.54±0.27	1.24±0.13	83.51
7	None	2360±48.48	64.20±0.73	52.10±1.55	46.86±1.59	1.04±0.10	83.97
	Enzyme,	2335.60±35.76	64.80±0.49	51.96±0.47	46.86±0.59	1.22±0.27	83.42
	Probiotic	2183±62.52	64.80±0.73	52.76±0.67	45.88±0.65	1.38±0.17	83.52
	Enzyme & probiotic	2220±44.27	62.80±0.73	53.60±1.09	45.02±0.86	1.38±0.41	83.38
14	None	2380±34.79	69.60±0.69	51.64±0.91	47.54±0.80	0.86±0.08	83.61
	Enzyme,	2269±34.00	63.80±0.58	51.18±1.08	47.92±1.11	0.90±0.15	83.42
	Probiotic	2241.00±45.01	64.80±0.8	52.60±0.48	45.84±0.38	1.58±0.21	83.74
	Enzyme & probiotic	2303±60.32	64.20±0.66	53.00±0.70	45.50±0.59	1.48±0.18	83.31
21	None	2254±52.21	64.60±0.51	50.22±0.62	48.32±0.74	1.48±0.16	83.39
	Enzyme,	2000±13.78	71.20±1.28	51.34±0.55	47.64±0.58	1.04±0.13	83.11
	Probiotic	2174.0±49.55	59.00±0.63	51.62±0.80	46.98±0.88	1.36±0.14	83.57
	Enzyme & probiotic	2310.00±36.74	66.20±0.49	52.56±0.54	46.38±.59	1.08±0.14	82.85
28	None	2192±55.08	63.80±0.37	50.54±0.20	47.90±0.25	1.56±0.10	82.86
	Enzyme,	2178±50.04	62.20±0.37	53.50±1.46	45.44±1.53	1.02±0.11	82.47
	Probiotic	2216±75.54	64.00±0.95	50.88±0.48	47.68±0.44	1.42±0.09	82.81
	Enzyme & probiotic	2166.00±26.19	65.00±0.55	50.78±0.72	47.64±0.54	1.56±0.27	82.52

Table (13): Digestion Coefficient of crude fiber and ash values of experimental diets as affected by inclusion levels of date waste meal supplemented with either enzymes, probiotic or their combination.

Experimental treatments	Digestion Coefficient of	
	Fiber	Ash
Date levels, %		
0	34.63[a]	61.26[c]
7	32.65[b]	60.89[c]
14	33.33[a]	63.54[b]
21	30.57[c]	63.23[b]
28	28.32[d]	65.38[a]
Additives		
None	28.97[b]	59.70[b]
Enzyme,	33.00[a]	61.64[b]
Probiotic	31.68[ab]	64.81[a]
Enzyme & probiotic	33.95[a]	65.29[a]
SEM	2.94	3.02
Significant		
Date levels (D)	**	**
Additives (A)	*	*
DxA	*	*

a,b,c… Means of the same column with different superscripts are significantly different
* = (P≤0.05) ** = (P≤0.01);

Table (14): The effect of interaction between inclusion levels of date waste meal and enzymes, probiotics or their combination addition on the digestibility of crude fiber and ash.

Date levels, %	Additives	Digestion Coefficient of	
		Fiber	Ash
0	None	31.54	57.67
	Enzyme,	35.53	59.71
	Probiotic	34.44	63.22
	Enzyme & probiotic	37.02	64.45
7	None	29.65	56.75
	Enzyme,	33.92	58.62
	Probiotic	32.49	63.77
	Enzyme & probiotic	34.52	64.42
14	None	30.49	59.83
	Enzyme,	34.24	62.11
	Probiotic	33.25	66.11
	Enzyme & probiotic	35.34	66.12
21	None	27.38	61.41
	Enzyme,	32.18	62.70
	Probiotic	30.03	64.24
	Enzyme & probiotic	32.69	64.57
28	None	25.78	62.83
	Enzyme,	29.14	65.07
	Probiotic	28.20	66.71
	Enzyme & probiotic	30.16	66.90c

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الملخص العربي

الاستفادة من مسحوق مخلفات البلح مع إضافة الإنزيمات أو البروبيوتيك أو مخلوطهما على الأداء الإنتاجي لبدارى اللحم

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أجريت تجربة تقييم غذائي لمدة ٣٥ يوماً باستخدام ٤٨٠ كتكوت لحم عمر ٧ أيام غير مجنسة لهدف دراسة تأثير إحلال مستويات متدرجة من الذرة الصفراء بمسحوق مخلفات البلح باستخدام مستويات صفر ، ٧، ١٤ ، ٢١ ، ٢٨ % مكونين علائق متساوية في نسب الطاقة إلى البروتين مع إضافة الأنزيمات أو البروبيوتك أومخلوطهما وذلك على الأداء الانتاجي لبدارى اللحم وبعض صفات الذبيحة ومعاملات الهضم للألياف والرماد . قسمت الكتاكيت إلى عشرون

جموعة تجريبية بكل منها ٢٤ كتكوت . غذيت كل مجموعة على واحدة من خمس علائق وقد بيت تحت نفس الظروف من البيئية والرعاية.

تتلخص النتائج في النقاط التالية:

- أوضحت نتائج التحليل الغذائي على احتواء مسحوق البلح على كميات مناسبة من العناصر الغذائية التي تعتبر كمؤشر مبدئي لقيمته الغذائية وباعتباره مصدر من مصادر الطاقة.
- يمكن استخدام مسحوق مخلفات البلح حتى مستوى ٢١% بدون التأثير على وزن الجسم أو الزيادة المكتسبة وإضافة مخلوط الانزيمات والبروبيوتك أعطى قيم متساوية إحصائيا في هذا الشأن مقارنة بالكنترول.
- استبدال مسحوق مخلفات البلح بدل من الذرة الصفراء مع أو بدون إضافة علفية لم يؤثر على الكفاءة التحويلية للغذاء مع استثناء الكتاكيت عمر ٧ أيام.
- صفات الذبيحة المتضمنة الأفخاذ والصدر وقيم WHC لم تتأثر معنويا بالمستويات المختلفة لمسحوق البلح وكانت للإضافات العلفية تأثير على الأفخاذ. كما أوضحت النتائج زيادة النسبة المئوية للدهن الحشوى مع زيادة مستوى مسحوق البلح بالعلائق.
- أدى زيادة مسحوق البلح بالعلائق إلى انخفاض معامل هضم الألياف وزيادته للرماد وكان للإضافات العلفية تأثير محسن على تلك القيم.

لذا ينصح بإدخال مسحوق مخلفات البلح محل الذرة الصفراء بالعلائق حتى مستوى ٢١% ون استخدام الإضافات العلفية للحصول على أعلى أداء إنتاجي كما يمكننا استخدام مستوى ٢% مع إضافة مخلوط انزيمات والبروبيوتك للحصول على نتائج جيدة.