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EFFECT OF BIOLOGICALLY TREATED DATE PALM KERNELS AS A NON-TRADITIONAL FEED SOURCE ON PRODUCTIVE PERFORMANCE OF LACTATING BUFFALOES.

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SUMMARY

An experiment was conducted to study the effect of feeding up-graded date kernels by biological treatment as a non-traditional feed source to replacing parts of high concentrate ration on productive performance, rumen fermentation and nutrients digestibility of lactating buffaloes. The fungal strain (*Trichoderma harzianum*) was used to treat raw date kernels. Three rations were formulated R1 (the control) consisted of 60% commercial ready made feed (purchased from local feed mills) + 40% rice straw, R2 consisted of 45% commercial ready made feed + 15% biologically treated date kernels (BTDK) + 40% rice straw and R3 consisted of 30% commercial ready made feed + 30% (BTDK) + 40% rice straw. R1 represented the control; while R2 and R3 were represented rations contained 15 or 30% biologically treated date palm kernels (BTDK). Rations were fed to midlactation buffalo cows (4 animals per treatment) for 3 months. A digestibility trail was conducted to determine the digestibility coefficient and nutritive value of the tested rations using nine adults Ossimi rams. Results obtained revealed that biological treatment almost doubled the protein content after 10 days of incubation. Insignificant differences ($P \geq 0.05$) were found among R1, R2 and R3 in the values of rumen pH and NH_3-N concentration. On the other hand R3 recorded ($P \leq 0.05$) higher TVFA's concentration compared with R1, while insignificant differences were observed among R3 and R2 and among R2 and R1 respectively. Insignificant differences were observed among the three tested groups in all blood parameters, milk yield and milk composition. Dry matter intake for R2 or R3 were decreased by 3.5 and 6.5% compared with R1. Incorporation of BTDK at 15 or 30% in the ration decreased DM/kg/milk by 4.71% or 12.35% compared with the control. In contrary, each kg TDN and DCP/kg milk was found to be increased as the level of incorporation BTDK in the ration increased. Relative economic efficiency was 17.8 and 27.7% better for R2 and R3 compared with the control group.

Keywords: *biological treatments, date kernels, lactating buffaloes, digestibility coefficients, economic efficiency,.*

INTRODUCTION

Date production in Egypt has been steadily increasing over the last 30 years. In 2005, numbers of palm trees (*Phoenix doctylifera* L.) were found to be 9 million, producing almost 900 thousand tons date crop per year (Agriculture Economic and Statistics Institute, 2006). A large quantity of non-fruits components of the date palm (rond basis, frond midrib, leaflets, spadix stalks, spathes fruit stems) and fruit by-products (cull dates, seeds and extracted pulp from processing units) are wasted. All parts and by-products of date can be added to the feed mixtures of ruminants (Bukhaev *et al.*, 1985). Date palm seeds, also called pits, kernels of pips from a part of the integral date fruit compose about 30% of the dates and represent about 222 thousand tons which are wasted per annum.

Imrie and Righelato (1976) reported that celluolytic fungi have the ability to produce extra cellular enzymes known as cellulase, which can hydrolyze cellulose to fermentable sugars. The cellulase, complex of fungi is known to be rich in exo-β-1, 4 gluconase, endo-β-1,4 gluconase and β-glucosidase, which are responsible for the stepwise hydrolysis of cellulose to glucose. The organisms that suit for this purpose must have a number of special properties. They must be to grow on a wide range of carbon sources, have high growth rates to minimize the size of the fermentation system and have a high efficiency in converting of the substrate to biomass with high protein content. A promising method of utilizing lignocelluloses agricultural wastes is to increase their protein content, then use them as feed for ruminants. Since the accessibility of cellulose is inhibited by the presence of lignin, the digestibility of carbohydrates from the waste can be increased considerably by the decrease of its lignin content. Since the chemical de-lignifications of wastes are too expensive for the fodder industry, the best way to utilize lignocelluloses seems to be bioconversion by organisms having ligninolytic activities, such as several fungi (Kornelia, 1983).

The objective of this investigation was to study the effect of biological treatment on improvement of date kernels nutritive value and its effect on productive performance of lactating buffalo when used to replace a part of its concentrate feed.

MATERIALS AND METHODS

The feeding trail of this study was conducted for 3 months at Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture, Egypt. The fungal strain (*Trichoderma harzianum*) was obtained from the Microbial Chemistry Department, National Research Center, Dokki, Cairo, Egypt and used to treat 2 tons of date kernels.

Aflatoxin determination of untreated and treated date palm kernels and concentrate feed mixture was carried out by using the chromatography method modified by (Abdel-Hamid 1980). Inoculums was incubated in one liter conical flask, in 500 ml medium containing 10.0 $(NH_4)_2SO_4$, 5.0 peptone, 0.5 $MgSO_4$, 0.3.7H_2O, $CaCl_2$ and 10 glucose (g/l). Flasks were sterilized, cooled and inoculated with 3 days old slant of *Trichoderma harzianum* F.405 *(T. harzianum)*. Then incubated at (30 °C) in rotary shaker 150 rpm for 48 hrs. These inoculums were used to inoculate 50 liters fermentor containing 40 liters of sterilized medium containing the composition of the same above mentioned medium by 10% (v/v) then incubated for 72 hrs. to produce 480 gm fungal biomass. The fungal cultures were used for enrichment of the experimental date kernels for a period of 30 days. Samples of the treated material were taken every ten days for chemical analyses to follow the progress of the fermentation process. Concentrate feed mixture, rice straw and treated or non-treated date kernels were chemically analyzed according to A.O.A.C (1990)

method. Neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) were determined by the methods of Van Soest (1982).

Three rations were formulated, R1 (the control) consisted of 60% commercial ready made feed (purchased from local feed mills) + 40% rice straw, R2 consisted of 45% commercial ready made feed + 15% biologically treated date kernels (BTDK) + 40% rice straw and R3 consisted of 30% commercial ready made feed + 30% (BTDK) + 40% rice straw. A digestibility trial was conducted using nine mature local Ossimi breed rams (3 animals each) weighing on average 55 kg and 3 years old. Animals were housed into individual metabolic cages for 42 days (35 days as a preliminary period followed by 7 days as collection period), to determine the digestibility coefficients and nutritive value of the three tested rations. Average feed consumed per animal per day (as fed) was calculated as 730 g concentrate + 485g roughage during the preliminary period and 660 g concentrate and 440 g roughage during the collection period. At the end of the collection period, feces samples of each ram were mixed well and kept in the refrigerator for subsequent chemical analysis. Rumen liquor samples were taken from each animal at the end of collection period at 4 hours after feeding by a rubber stomach tube. Rumen liquor pH was measured by pH meter (Orin-Res-EARH, model 30) and ammonia nitrogen (NH_3-N) was immediately determined by the micro-diffusion method of (Conway 1963). Frozen rumen liquor samples were analyzed for total volatile fatty acids (TVFA's) by steam distillation according to (Abou-Akkada and Osman 1967). Total fungal counts were determined according to (Difco, 1984) and microbial protein was measured by sodium tangistate methods according to Shultz and Shultz (1970). Chemical composition of feeds, feces and urine were determined according to (A.O.A.C., 1990) method. Neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) were determined by the methods of Van Soest (1982). Total volatile fatty acids fractions were determined using HPLC (Column: Rezex organic, Dimensions: 300x7.8, Mobile phase: 1% Orthophosphoric, Flow rate: 0.8 Detector: UV and Wave length (220 nm) according to Buch *et al.* (1979).

Twelve lactating Buffaloes weigh on average 550 kg ± 15 kg were allotted randomly into three similar groups (four animals each) according to their milk yield. Animals were kept tied in door house. Nutrient requirements for the experimental animals were calculated according to (Ghoniam, 1967). Feed offered twice a day at 8.a.m. and 3 p.m. individually, while water was offered *ad lib.* Milk yield was recorded daily. Representative milk samples were taken once biweekly from each animal, from morning and evening milking of the same day. The samples were composed and analyzed for total solids (TS), fat and total protein (TP) according to (Ling 1963). Blood samples were drawn from the jugular vein and centrifuged for 20 min at 3000 r.p.m. The supernatant was frozen and stored at -20°C for subsequent analysis. Plasma total protein was determined according to (Armstrong and Carr 1964); albumin according to (Doumas *et al.*, 1971); GOT and GPT according to (Reitman and Frankel, 1957); creatinine according to (Folin, 1994) and urea according to (Siest *et al.*, 1981).

The experimental data were statistically analyzed using one way classification analysis of variance according to SPSS (1997). Differences among rations mean were detected using Duncan Multiple Range Test (Duncan 1955).

RESULTS AND DISCUSSION

Chemical composition:

Chemical composition of raw date kernels, treated kernels after 10, 20 and 30 days of incubation, recovery rate of treated kernels and finally treated kernels, rice straw and

concentrate feed mixture and the formulated rations were shown in (Tables 1, 2 and 3). As presented in Table (1), it is clearly to notice that the biological treatment had altered the chemical composition of date kernels after 10, 20 and 30 days compared with untreated one. Protein content was observed almost to be doubled after 10 days of treatment then increased slightly after 20 and 30 days of treatment. In contrary, CF and its fractions contents were decreased linearly as shown in Table (1). It was also realized that as period of incubation increased, NFE content decreased. This reduction in NFE and CF content of treated materials could be used as energy source by the fungus for their growth and multiplication. Ash content was increased in the treated date kernels as the period of incubation advanced compared with untreated materials. This increase in ash content in the treated material may be a result of the reduction in the organic mater due to microbial fermentation which reflects on the loss of organic matter as shown in Table (1).

Date kernels like other crop or agro-industrial wastes are characterized by low crude protein content, high indigestible crude fiber and low palatability (Church 1980). Therefore, to improve the feed intake and feeding values of date kernels, several methods can be used such as physical, chemical and biological treatments (Hassona 1986 and Abd El-Ghani 1997). (Mohamed *et al.*, 1971) reported that raw date kernel was found to contain 92.5, 6.3, 22.4, 8.4, 53.9 and 1.6% DM, CP, CF, EE, NFE and ash respectively. While (Ahmed *et al.*, 1999) found raw date kernel contains 90.9, 7.6, 13.6, 7.3, 69 and 2.5% DM, CP, CF, EE, NFE and ash respectively. Mahgoub (2001) reported that soaked date seeds contained 63.5, 97.2, 7.3, 4.4, 18.1, 67.3 and 2.7 % DM, OM, CP, EE, CF, NFE and ash respectively.

Table (1): Chemical analysis (%) of non-treated and bio-treated at different stage of pretreatment of date kernels.

Item	Raw date kernels	Period of biological treatment (days)		
		10	20	30
DM	93.07	92.43	89.80	88.10
OM	95.17	89.14	86.42	85.20
CP	6.33	11.35	12.50	13.4
CF	25.63	19.64	17.31	13.20
EE	3.25	1.30	1.10	1.01
Ash	4.83	10.86	13.58	14.80
NFE	59.96	56.85	55.51	57.59
NDF	77.72	60.01	51.40	50.11
ADF	49.78	41.72	35.20	34.15
ADL	25.66	20.13	15.91	14.20
Cellulose	27.94	18.29	16.20	15.96
Hemi-cellulose	24.12	21.59	19.29	19.95
Aflatoxin µg/kg	16.10	16.25	16.05	16.10
DM recovery rate of BTDK:				
Raw date kernels, kg	**2000**	**1950**	**1850**	**1800**
Recovery %	**100**	**97.5**	**92.5**	**90.0**

The recovery rate was calculated as the remained date kernels after (10, 20 and 30 days) of biological treatment divided by the initial amount of raw date kernels multiplied by 100 according to (Abo-Eid et al., 2007).
*(e.g 1950/2000*100=97.5 %).*

Table (2): Chemical composition of ingredients used to tested rations (% of DM basis).

Item	Biological treated date kernels (BTDK) 30 days	Rice straw	Commercial Concentrate feed mixture
DM	88.10	91.51	90.63
OM	85.20	89.11	92.34
CP	13.4	4.80	11.25
CF	13.20	40.44	14.35
EE	1.01	1.50	2.59
Ash	14.80	10.89	7.66
NFE	57.59	42.37	64.15
NDF	50.11	74.20	40.2
ADF	34.15	40.31	22.0
ADL	14.20	10.50	6.5
Cellulose	15.96	33.89	18.2
Hemi-cellulose	19.95	29.81	15.5

Gupta and Langer (1988) observed an increase in CP content of straw from 3.25 to 8.38 % after fungal treatment. Kahlon and Kalra (1987) noticed an increase in CP and ash contents of paddy straw from 5.12 to 9.62 and 9.00 % (CP) and from 16.82 to 24.25 and 23.44 % (ash) when fermented with *P. ostreatus* and *Sporotrichum pluverlentum* with 0.08 % ammonium chloride, respectively. Dhanda *et al.,* (1994) used fermented wheat straw with white rot fungi and noticed that, the CP content of spent straw increased from 3.42 to 6.18%, so, OM was decreased as a result of the fungal treatment. Chawla and Kundu (1985) showed that treating wheat straw with some strains of fungi supplemented with urea and ammonium sulfate mixture reduced the content of NDF, ADF, ADL and hemicellulose by 19.21, 15.26, 52.62 and 41.20%, respectively with a significant increase in crude protein.

Table (3): The formula and chemical composition of experimental rations.

Item	Experimental rations		
	R1	R2	R3
***BTDK, %**	-	15	30
****CCFM,%**	60	45	30
*****RS,%**	40	40	40
Calculated chemical composition of the experimental rations on DM basis, %:			
DM	90.98	90.60	90.22
OM	91.04	89.97	88.90
CP	8.67	8.99	9.31
CF	24.7	24.61	24.44
EE	2.15	1.91	1.68
Ash	8.95	10.02	11.09
NFE	55.43	54.45	53.47
NDF	53.80	55.28	56.77
ADF	29.32	31.14	32.96
ADL	8.10	9.25	10.41
Cellulose	24.47	24.14	23.80
Hemi-cellulose	21.22	21.89	22.55

* *BTDK: biologically treated date kernel.*
** *CCFM: Commercial concentrate feed mixture.* *** *RS: Rice straw.*

Digestibility coefficients:

As shown in Table (4), R3 recorded (P<0.05) the highest digestibility coefficients for all nutrients and nutritive value compared with R2 and R1 (control). In the mean time R2 was (P<0.05) better in all nutrients digestibility coefficients and nutritive value compared with R1. These remarkably improve in all nutrients digestibility in rations contained biologically treated date kernels compared with the control. So, it could be attributed to the effect of biological treatment by Trichoderma fungi in up grading and positive alteration of the chemical composition of date kernels as shown in Table 3. These positive results could be also supported by the earlier investigations in using even raw date kernels in small or large ruminant's rations, which recorded positive impact in improving its digestibility coefficients of DM, OM, CP, CF, EE, NFE and the nutritive value (Hamra 1978, Kholif and Abo El-Nore, 1993, Abou El-Nor and Kholif 1995). Rashed and Alwahsh (1976) reported an improvement in the digestibility coefficients of DM, OM, EE, CF and NFE with increasing date seeds level in sheep ration while CP digestibility decreased, giving a net increase in TDN. Nassar (2002) reported that the nutrients digestibility for lambs fed diets containing olive pulp and date stone and radicell were similar to the control group. El-Sayed (1994) found no adverse effect on all nutrients digestibility and nutritive value (TDN and DCP) as a result of substituting half of the concentrate feed mixture in the control ration of sheep (50% clover hay + 50% concentrate mixture) by date seeds. Mahgoub (2001) reported that nutrients digestibility and nutritive value (TDN and DCP) were significantly higher for buffalo fed control diet compared with diet contained date seeds. El-Ashry *et al.*, (2002 and 2003) reported that biological treatments with different fungal strain decreased cell wall constituents of different crop residue. Also, El-Ashry *et al.*, (1997) found that TDN content increased from 63.93 and 63.35% in untreated rice straw and corn stalk to 72.31 and 72.88% in fungal treated ones, respectively.

Table (4): Effect of biological treatments on digestibility coefficients and nutritive value.

Item	Experimental rations		
	R1	R2	R3
Digestibility coefficients, %			
DM	70.8 ± 0.69 ^{c}	78.1 ± 0.44 ^{b}	82.0 ± 0.74 ^{a}
OM	73.2 ± 0.48 ^{c}	77.3 ± 1.10 ^{b}	82.5 ± 0.67 ^{a}
CP	68.2 ± 0.71 ^{b}	75.9 ± 0.81 ^{ab}	77.4 ± 3.80 ^{a}
CF	68.05 ± 1.1 ^{c}	75.4 ± 0.62 ^{b}	82.8 ± 0.32 ^{a}
EE	76.2 ± 1.68 ^{b}	81.3 ± 0.65 ^{a}	84.2 ± 0.99 ^{a}
NFE	68.7 ± 0.44 ^{c}	78.5 ± 0.46 ^{b}	82.4 ± 0.59 ^{a}
Digestibility of cell wall constituents, %			
NDF	66.4 ± 0.45 ^{c}	69.0 ± 0.34 ^{b}	71.8 ± 0.71 ^{a}
ADF	64.9 ± 0.23 ^{c}	68.3 ± 0.38 ^{b}	72.8 ± 0.88 ^{a}
ADL	66.2 ± 0.32 ^{c}	68.8 ± 0.70 ^{b}	73.2 ± 0.39 ^{a}
Cellulose	65.7 ± 1.18 ^{c}	69.0 ± 0.25 ^{b}	71.7 ± 0.71 ^{a}
Hemi-cellulose	63.9 ± 1.17 ^{c}	68.5 ± 0.47 ^{b}	68.6 ± 0.60 ^{a}
Nutritive value,%			
TDN	55.6 ± 0.56 ^{c}	63.8 ± 0.47 ^{b}	68.6 ± 0.60 ^{a}
DCP	6.4 ± 0.19 ^{c}	7.0 ± 0.25 ^{b}	8.9 ± 0.12 ^{a}

^{a,b} means in the same raw for each parameter with different superscripts are significantly different (P<0.05).

Rumen fermentation:

Results in Table (5) revealed insignificant differences among R1, R2 and R3 in the values of rumen pH and NH_3-N concentration. However groups fed BTSK (R2 and R3) recorded slightly higher NH_3-N concentration compared with the control (R1). On the other hand R3 recorded ($P<0.05$) higher TVFA's concentration compared with R1. While insignificant differences were observed among R3 and R2 and among R2 and R1, respectively. This improvement in TVFA's concentration in R2 and R3 may be attributed to alteration in chemical composition of date kernels by the biological treatment by Trichoderma fungi. Regarding to volatile fatty acid fractions, insignificant differences were found among R1, R2 and R3 in concentration of acetic, propionic, A/P ratio, butyric and iso-butyric acids. While R1 and R2 were significantly ($P<0.05$) in valric acid value compared with R3. Kholif *et al.* (1996) found that the concentration of NH_3-N and TVFA's were (17.9, 4.84 and 22.2 and 7.12 meq/100ml), respectively in goats fed control ration and ration contained 30% date seeds. Abdullah and Hatayalung (1988) found relatively high concentration of rumen NH_3-N and similar concentration of rumen VFA concentration for all cattle fed ration contained 89% palm kernel cake. On the other hand El-Sayed (1994) reported that the ruminal pH values were decreased, while NH_3-N and TVFA's concentration were increased as the sampling time advanced post feeding when sheep fed rations contained 25, 50 and 75% date seeds. Moreover, he added that increasing date seeds levels in the ration had no significant effect on propionic acid and butyric acid molar percentage at 2 hours post feeding and acetic acid/proionic acid ratio. Sabbah *et al.* (1997) and Ahmed *et al.* (1999) indicated that replacing yellow corn up 100% by date seeds in the concentrate mixture had no marked effect on ruminal pH, NH_3-N, TVFA's, propionic acid, butyric acid and acetic acid/propioinc acid ratio. Chandra *et al.* (1991) reported that the *In vitro* production of total nitrogen, ammonia-nitrogen (mg/dl), pH and TVFA (meq/l) in sheep rumen liquor was affected by microbial treatment *Trichoderma viride, Aspergillus niger* and mixture of *Trichoderma viride* and *Aspergillus niger* of paddy straw by when compared with untreated materials. El-Ashry *et al.*, (1997) and Khorshed (2000) noticed that NH_3-N concentration increased in rumen of sheep and goats fed on ration treated with white rot fungi or yeast culture.

Table (5): Effect of biological treatments on rumen parameters and volatile fatty acids fractions.

Item	Experimental rations		
	R1	R2	R3
pH	6.6 ± 0.02	6.5 ± 0.02	6.5 ± 0.02
NH_3-N (mg/100ml)	19.8 ± 0.15	21.4 ± 0.62	21.3 ± 0.80
TVFA's (meq./100ml)	9.00 ± 0.29 ^{b}	10.4 ± 0.52 ^{ab}	11.0 ± 0.56 ^{a}
TVFA fractions, %			
Acetic	51.3 ± 5.70	55.3 ± 1.40	57.9 ± 0.15
Propionic	20.0 ± 1.47	22.4 ± 0.83	21.3 ± 2.43
A/P ratio	2.5	2.4	2.7
Butric	24.6 ± 4.10	19.1 ± 1.39	18.7 ± 1.38
Isobutric	1.4 ± 0.15	1.4 ± 0.27	1.1 ± 0.37
Valeric	2.5 ± 0.10 ^{a}	2.7 ± 0.27 ^{a}	1.6 ± 0.02 ^{b}

^{ab} means in the same raw for each parameter with different superscripts are significantly different ($P<0.05$).

Total fungal counts and microbial protein:

As shown in Table (6), R3 and R2 were found to achieve (P<0.05) higher total fugal count compared with R1, the control. R3 was also found to have (P<0.05) higher content of microbial protein compared with R2 and R1 respectively. In the mean time R2 was (P<0.05) higher in microbial protein compared with R1. This significance increase both in total fungal count or microbial protein in favor of groups fed BTDK compared with the control group could be attributed to using Trichoderma fungi micro organism for biological treatment of date kernels and its effect in increasing CP content from 6.33 to 13.4%.

Table (6): Effect of biological treatments on total fungal counts and microbial protein.

Item	Experimental rations		
	R1	R2	R3
Total Fun. Cou. ($x10^3$cfu/ml)	1.0 ± 0.02^{c}	1.2 ± 0.02^{b}	1.3 ± 0.01^{a}
M. protein (g/100ml)	0.3 ± 0.02^{c}	0.4 ± 0.22^{b}	0.5 ± 0.02^{a}

^{a,b} means in the same raw for each parameter with different superscripts are significantly different (P<0.05).

Blood constituents:

Results of blood constituents for R1, R2 and R3 as illustrated in Table (7) showed insignificant differences (P>0.05) among the three tested groups in all blood parameters. All parameters were found to be within the normal range as reported by Kaneko *et al.* (1997). El-Sayed (1994) found no marked effect in blood total protein, albumin, globulin, urea-N, cholesterol and creatinine as well as GOT and GPT as a result of feeding sheep on date seeds at levels of 25, 50 and 75% replacing concentrate feed mixture. Kholif *et al.*, (1996) found insignificant differences in serum total protein, albumin, globulin and GOT while significant in albumin/globulin ratio, urea and glucose among goats fed 100% clover hay, 70% clover hay + 30% raw date seeds and 40% clover hay + 30% date seeds + 30% concentrate mixture. Sabbah *et al.* (1997) reported that replacing 50 or 100% of yellow corn in the concentrate mixture of lactating cows by date seeds had no significant effect on all blood constituents. On the other hand, Ahmed *et al.* (1999) found that substituting 50 or 100% yellow corn in the concentrate mixture of Friesian calves diets by date seeds had significant effect on serum total protein, albumin and urea but insignificant on globulin and albumin/globulin ratio.

Table (7): Effect of biological treatments on blood parameters for buffaloes.

Item	Experimental rations		
	R1	R2	R3
Total protein (g/dl)	9.9 ± 0.23	10.5 ± 0.90	10.38 ± 0.29
Albumin (g/dl)	7.2 ± 0.17	7.50 ± 0.67	7.5 ± 0.17
Globulin (g/dl)	2.7 ± 0.71	2.99 ± 1.40	2.8 ± 0.78
A/G ratio	2.6	2.5	2.6
Cereatinine (mg/dl)	1.4 ± 0.10	1.4 ± 0.02	1.4 ± 0.02
GOT (U/ml)	11.5 ± 0.50	11.6 ± 0.67	12.4 ± 0.67
GPT (U/ml)	18.4 ± 0.33	17.7 ± 3.37	18.6 ± 1.67
Urea (mg/dl)	47.4± 4.10	49.3 ± 3.46	47.8 ± 0.86

Milk composition:

Milk yield and its composition are shown in Table (8). Analysis of variance showed insignificant differences (P>0.05) among the control group and the groups fed biologically treated date kernels in the average daily milk yield. However, R3 and R2 were found to have slightly higher milk yield account for 10.9 and 4.7% compared with R1 (the control), respectively. The same trend of insignificancy was observed among the three tested groups in fat, protein, lactose total solid percentages. However R1 was slightly lower in total solid compared with R2 and R3. In the mean time R3 and R2 were slightly higher in fat, protein and lactose content compared with R1. Mahgoub (2001) in a study on replacing 30% of concentrate feed mixture by date kernels or 30 or 60% mixture of date kernels + poultry droppings silage on lactating buffaloes reported that groups fed rations contained DK or DK + poultry droppings silage showed insignificant difference in average daily milk yield kg, fat corrected milk, protein, lactose and ash percentages compared with the control. Results obtained by Sabbah *et al.* (1997) were found to be in agreement with the results obtained in this current study.

Table (8): Effect of biological treatments on milk yield and milk contents for buffaloes.

Item	Experimental rations		
	R1	R2	R3
Milk yield, kg/h/d	6.5 ± 0.26	6.7 ± 0.10	7.1 ± 0.10
Fat %	6.5 ± 0.29	6.5 ± 0.17	6.8 ± 0.10
Protein %	4.4 ± 0.16	4.4 ± 0.02	4.4 ± 0.02
Lactose %	5.2 ± 0.02	5.5 ± 0.15	5.3 ± 0.17
Total solid %	16.9 ± 0.74	17.3 ± 0.28	17.4 ± 0.36

Feed and economic efficiency:

As given in Table (9), dry matter intake for groups fed BTDK (R2 or R3) were found to be 3.5 and 6.5% less than that of the control fed group (R1), respectively. In contrary, Deraz (1996) found that chemical and biological treatments increased markedly voluntary DM intake of corn stalks of growing lambs by 63.3 and 33.8%, respectively, when compared with mechanically treated corn stalks. Feed efficiency as kg DM/kg/milk produced (Table 9) was found to be decreased as the level of incorporation BTDK in the ration which increased by 4.71% or 12.35% compared with the control, respectively. These findings could be attributed to high milk yield as well as low dry matter intake recorded by R2 and R3 compared with the control (R1). In contrary, each kg TDN and DCP/kg milk was found to be increased as the level of incorporation BTDK in the ration increased. These findings could be attributed to the high content of DCP and TDN in R2 and R3 as shown in Table (4). These results are in agreement with results reported earlier by Sabbah *et al.*, (1997 and Mahgoub (2001).

In Egyptian pound/head/day, per kg milk produced were decreased in favor of groups fed BTDK compared with the control group. Relative economic efficiency was 17.8and 27.7% better for R2 and R3 compared with the control group. The improvement in economic efficiency for groups fed BTDK compared with the control could be related to the low price of BTDK compared with the high prices of concentrate feeds as well as the positive effect of biological treatment in improvement the nutritive value of date kernels.

Table (9): Feed consumption, feed efficiency and economic evaluation of tested rations.

Item	Rations		
	R1	R2	R3
No. of animal	4	4	4
Feed intake, kg DM/h/d			
CFM	5.89	4.24	3.80
RS	5.49	5.49	5.49
BTDK	-	1.11	1.34
Total DMI, kg	11.38	10.84	10.63
Feed efficiency			
Kg DMI/kg milk	1.70	1.62	1.49
Kg TDN/kg milk	0.98	1.03	1.02
Kg DCP//kg milk	0.11	0.11	0.13
Economical evaluation			
Total feed cost, LE/h/d	6.80	6.35	5.90
Feed cost, LE/kg milk yield	1.06	0.95	0.83
Relative economic efficiency %	100	117.8	127.7

CONCLUSION

As a result of the positive impact on productive and economic performance of lactating buffaloes obtained in this current study, it could be concluded that, biologically treated date kernels is a suitable and cheap agro-industrial by-products for substituting up 30 % of the ration of lactating buffaloes.

REFERENCES

Abd El Ghani, A. A. (1997). Using of ensiling palm kernel meal with broiler litter for feeding lambs. Annals of Agric. Sci., Moshtohor, Vol. 35 3): 1211-1222.

Abd El-Hamid, A.M. (1980). Mykotoxin in Osterreichischen Fuuttermitteln, Bodenkultur Universitat. Wien.

Abdullah, N and R. Hutagalung (1988). Rumen fermentation, urease activity and performance of cattle given palm kernel cake based diet. Animal feed Science and Technology, 20: 1 79-86.

Abo-Eid, H. A.; M. A. El-Ashry; M. M. Khorshed and H.El-Sayes (2007). Effect of biological treatments of some crop residues on their nutritive values 1- Effect of biological treatments on recovery rate, chemical composition and in situ disappearances. Egyptian J. Nutrition and Feeds, 10 (2): Special Issue: 493-508.

Abou Akkada, A. R. and H.E. Osman (1967). The uses of ruminal ammonia and blood urea as an index of the nutritive value of protein in some food stuffs. J. Agric. Sci.,69: 25-31.

Abou El-Nor, S. A. H. and A. M. Kholif (1995). Date seeds as a new component in diets for dairy animals. 2- In- vitro and In- vivo digestibility studies by goats. Egyptian J. of Dairy Sci. 23: 167.

Agriculture Economic and Statistics Institute (2006). Ministry of Agriculture, Agric., Economics, Part 1. Publ. By Agric. Res. Center, Egypt.

Ahmed, M., A. Sayeda; M. Abdou and M. R. Hammad (1999). Using date seeds in fattening rations of Frisian calves. J. Nutrition and Feeds.special issue): 189-198.

A.O.A.C. (1990). Official Methods of Analysis 13th Ed. Association of Official Agricultural Chemists. Washington, DC, USA.

Armstrong, W. D. and C. W. Carr (1964). Physiological . Chemistry 3rd ed. P., 75. Burges Publishing CO. Minneapolis, Minnesota.

Bukhaev, V. T.; M. F. Abbas; S. O. Al-Haydari and M. S. Maysera (1985). Chemical and biological studies on date palm parts and by-products for use as feedstuffs for ruminants. Agric. And water Resources Research Center., Sci., Res. Council. Baghdad.Iraq. Zanco 3, 4.

Bush, K.J.; R.W. Russell and J.W. Young (1979). Quantitative sepation of volatile fatty acids by high pressure liquid chromatography. J. Liquid. Chromat.

Chandra, S.; M. R. Reddy and G.V.N. Reddy (1991). Effect of fungal treatment of paddy straw on nutrient utilization in complete diets for sheep. Indian J. Anim. Sci., 61(12): 1330 – 1334.

Chawla, A. and S. S. Kundu (1985). Chemical changes and dry matter disappearance in fungi treated wheat straw. Asian J. Dairy Res. 4 3): 137- 142.

Church, D. C. (1980). Digestive physiology and nutrition of ruminants.Vol. I. Digestive physiology published by D.C. Church. Produced and distributed by D. S. U. Book stres, Inc.USR.

Conway, E.F. (1963). Modification analysis and volumetric error. Rev. ED. Look Wood. London.

Deraz, T. A. (1996) The production of microbial protein from some agricultural wastes and its utilization in ruminant. Ph. D. Thesis, Faculty of Agric. Ain Shams university.

Dhanda, S.; V. K. Kakkar; H. S. Garcha and G. S. Makkar (1994). Biological treatment of paddy straw and its evaluation through ruminant feeding. Indian J. Anim. Nutr., 112): 73-79.

DIFCO, M. (1984). Dehydrated Culture Media Regents for Microbiology, 10th edition, pp. 689-691, Difco Laboratories Incorporated Detroit, Michigan, USA.

Doumas, B.; W. Waston and H. Biggs (1971). Albumin standards and measurements of serum with bromocresol green. Clin. Chem. Acta, 31: 87.

Duncan, C. B. (1955). Multiple range and multiple F test. Biometerics.

El-Ashry, M. A; M. F. Ahmed; S. A. El-Saadany; M. E. S. Youssef; I. A. Gomaa and T. A. A. Deraz, (1997). Effect of microbial vs. Mechano-chemical or mechano-Biochemical treatments of crop residues on their use in ruminant rations, digestibility, nitrogen balance and some blood and rumen liquor parameters of sheep. Egyptian J. Nutrition and feeds 1"3-186.

El-Ashry, M. A; E. A. El-Basiony; E. E. Ragheb; M. M. Mohy El-Deen and W. S. El-Kader (2003). Soybean and sunflower meal in calf starters for Buffalo calves. Egyptian J. Nutrition and Feeds 13-24.

El-Ashry, M. A.; H. M. El-Sayed; M. Fadel; H. M. Metwally and M. M. Khorshed, (2002). Effect of chemical and biological treatments of some crop residues on their nutritive value. Egyptian J. Nutrition and Feeds 5 1): 43-54.

El-Sayed, I. M. (1994). Nutritive value and evaluation of some Crops, Vegetable and Fruits residues. M. Sc. Thesis, Fac. Agric. Cairo Univ., Egypt.

Folin, O. Z. (1994). Colorimetric of determination of plasma cereatinine. Phys. Chem. 268: 228.

Ghoneim, A. (1967). Animal Nutrition. 1st Ed. Anglo-Egyptian Lib. Cairo (Arabic text book).

Gupta, V. K. and P. N. Langer (1988). Pleurotus Floride for upgradingthe nutritive value of wheat straw. Biological wastes 23:57-64.

Hamra, A. H. (1978). The effect of feeding date stone on the productivity of ewes. M.Sc. Thesis, Baghdad Univ. Iraq.

Hassona, E. M. (1986). The utilization of treated feed stuffs in feeding ruminants animal. Ph. D. Thesis Fac. Agric. Zagazig Univ.., Egypt.

Imrie, F. K. and R. C. Righelato (1976). Ford from waste, Eds. By G.G. Birch, K. Y. Parker and J. T. Wodgan, Apl. Sa: Pulishers LTs. London, 79-89.

Kahlon, S. S. and K. L. Kalra (1987). Biological updgradtion of straw into protein rich feed.J.Res Punjab Agric.Univ 262) 1989.257-265.

Kaneko, J. J.; J. E. Harvey and W. J. Sitelu (1997). Clinical Biochemistry of Domestic Animals. 5th Ed. Harcourt Brace & Company Asia PTE. LTD. 898-899.

Kholif, A. M. and S. A. H. Abo-El-Nor (1993). Date seed as a new component in diets for dairy animals. 1. Proximate analysis, minerals, fatty acids and amino acids composition of date seed. 5th Arab Conference of Food science, Dokki, Cairo, Egypt, 27-30 December, 1993.

Kholif, A. M.; H. M. El-Sayed and S. A. H. Abo El-Nor (1996). Date seeds as new component in diets of dairy animals. 3- The effect of date seeds supplementation in goats rations on some ruminal and blood serum parameters. Egyptian J. Dairy Sci. 24: 153.

Khorshed, M. M. A. (2000). Different treatments for improving nutritional quality of some crop residues used in ruminant nutrition. Ph. D. Thesis, Fac. of Agric., Ain-Shams Univ.

Kornelia, Z. H. (1983). Protein environmental of lignocellulsic agricultural waste by Mushroom. Central Food Research Institute, Budappest Xl, Budafokiut 59, Hungary, July.

Ling, E. R. (1963). A text Book of dairy Chemistry. 3rd ED. Champan ana hall Ltd. London.

Mahgoub, A. A. S. (2001). Effect of feeding Egyptian buffalo with palm kernel meal on some productive traits. M. Sc. Thesis. Faculty of Agric. Minia University.

Mohamed, A.; A. K. El-Shazly and A. R. Abou Akkada (1971). The use of some agricultural by-products in feeding of farm animals. Alex. J. Agric. Res., 19: 25.

Nassar, M. S. M. (2002). Utilization of some agro-industrial by-products in fattening lambs on the natural ranges in the south of Valley. M. Sc. Thesis. Fac. Agric. Zagazig Univ., Egypt.

Rashed, N. H. and A. H. Al-Wash (1976). The effect of proportion of Date stones in the diet on its digestion and fermentation in the sheep rumen. Iraq J. agric. Sci., XX: 51.

Reitman, S. and S. Frankel (1957). Colorimetric determination of GPt activity according to the Reitman and Frankel method.Am.J.clim.path.28-56.

Sabbah, M. A.; M. A. Hanafy; H. A. Gomaa and M. Abdou Aziza (1997). Effect of ammoniation on date seeds utilization in dairy rations. Egypt J. Nutrition and Feeds special issue) 201-210.

Shultz, T. A. and E. Shultz (1970). Estimation of rumen microbial nitrogen by three analytical methods. J. of Dairy Sci., 53 (6): 781-784.

Siest, G.; J. Henny and F. Schiele (1981). Interpretion des examens de laboratories , karger Ed., P. 206.

SPSS (1997). Statistical package for the social sciences, release 6, SPSS Inc., Chicago, USA.

Van Soest, P. J. (1982). Nutritional Ecology of the Ruminal Books. Inc., Caravels, USA.

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تأثير معاملة نوى البلح بيولوجيا كمصدر علف غير تقليدى على الأداء الإنتاجي للجاموس الحلاب

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تم إجراء تجربة لدراسة تاثير تغذية نوى البلح المعامل بيولوجيا كمادة علف غير تقليدية لاحلاله محل جزء من العلف المركز على الاداء الانتاجى وقياسات الكرش ومعاملات الهضم للجاموس الحلاب. تم استخدام فطر (*Trichoderma harzianum*) فى معاملة نوى البلح وتم تكوين ٣ علائق العليقة الاولى (مقارنة) ، العليقة الثانية والثالثة مثلت المجموعات التى تغذت على علائق ١٥ ، ٣٠٪ نوى بلح معامل بيولوجيا. تم تغذية العلائق لجاموس حلاب فى مراحل الانتاج المتوسطه بمعدل ٤ حيوانات لكل مجموعة لمدة ٩٠ يوم وتم إجراء تجربة هضم على كباش بالغة لتقدير معاملات الهضم والقيمة الغذائية للعلائق المختبرة.

واوضحت النتائج ما يلى:

١. أدت المعاملة البيولوجية لنوى البلح الى تضاعف نسبة البروتين تقريبا عن النوى الغير معامل بعد ١٠ ايام من اجراء المعاملة.

٢. لم توجد فروق معنوية بين المعاملات الثلاثه فى قيم الـ pH ، NH_3-N. على الجانب الاخر سجلت المجموعة الثالثة تركيزا اعلى فى قيم الـ TVFA'S بمجموعة المقارنة بينما لم توجد فروق معنوية بين المجموعة الثانية والثالثة والثانية ومجموعة المقارنة.

٣. لم توجد فروق معنوية بين الثلاث مجاميع بالنسبة لقياسات الدم وايضا فى انتاج اللبن وتركيبه.

٤. وجد ان الماكول من المادة الجافة للمجموعتان الثانية والثالثه اللتان تغذيتا على نوى البلح المعامل بيولوجيا أقل من المجموعة الأولى (المقارنة) بمعدل ٣.٥ و ٦.٥٪ على التوالي.

٥. وجد أن قيمة الكفاءة الغذائية (كجم مادة جافة/كجم لبن منتج) قد تناقصت بزيادة مستوى إضافة نوى البلح المعامل بيولوجيا فى العليقة الثانية والثالثة بمعدل ٤.٧١ و ١٢.٣٥٪ على التوالى بالمقارنة بالمجموعة الأولى (المقارنة) وعلى عكس ذلك وجد ان قيمة الكفاءة الغذائية (مركبات كلية مهضومة/كجم لبن منتج) والبروتين المهضوم /كجم لبن منتج تزداد بزيادة اضافة النوى المعامل بيولوجيا بالعليقة.

٦. حققت المجموعة الثانية والثالثة ١٧.٨ و ٢٧.٨٪ معدل كفاءة اقتصادية اعلى من مجموعة المقارنة.

يستخلص من هذه الدراسة انه من الممكن احلال نوى البلح المعامل بيولوجيا محل العلف المركز فى علائق الجاموس الحلاب حتى ٣٠٪ فى ظل الزيادة الكبيرة فى أسعار العلف المركز وذلك دون حدوث اى تاثيرات سلبية على الأداء الانتاجى وكذلك صحة الجاموس الحلاب.