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EFFECT OF USING DISCARDED DATES ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF LACTATING FRIESIAN COWS

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ABSTRACT

Twenty lactating Friesian cows with average live body weight of 550 ±18 kg in their the 2nd to 5th parity were used to study the effect of replacing yellow corn grains (YCG) by discarded dates (DD) in concentrate feed mixture (CFM) at levels of 0, 33, 66, and 100% (w/w), on their productive and reproductive performance. Cows were assigned randomly to four similar groups (5 in each) according to milk yield, parity and live body weight (LBW). The levels of replacement of YCG by DD in CFM were0, 33, 66, and 100% (w/w) for G1 (control), G2, G3 and G4 as tested rations, respectively.

Results showed that the contents of OM, CP and NFE were higher in YCG-compared to DD-ration, however the content of CF and ash showed an opposite trend. Cows in G3 (66% DD) recorded the highest (P<0.05) digestibility coefficients of all nutrients, nutritive values and the intake of DM, TDN and DCP, followed by G2 and G4, while G1 (control) almost had the lowest values. The pH value in rumen liquor markedly decreased after feeding and its values 3 h after feeding were lower (P<0.05) with the DD-rations than control. The highest TVFA's concentration in rumen liquor was recorded with in G3 after feeding, while the lowest concentration was found in G1 after feeding. Ammonia-nitrogen concentration in G3 was higher before and after feeding than the other treatments. Cows in G3 had the highest concentrations of total proteins, globulin and glucose and the lowest concentrations of albumin and total lipids in blood plasma. Yield as actual milk and 4% FCM were higher (P<0.05) for DD-rations than those of control, being the highest in G3. Cows in G3 recorded the highest (P<0.05) percentages of fat, protein, and total solids in milk. Cows in G3 showed the best feed efficiency (DM, TDN and DCP: 4% FCM) compared with those fed the other rations (P<0.05). Average daily feed cost was higher (P<0.05)in G2 and G3 as compared to G1 and G4. While, cows in G3 showed the lowest feed cost/ kg 4% FCM and the best economic efficiency followed by G4 and G2, while G1 had the opposite trends. Cows in G3 had the best of most reproductive traits as first estrus, first service, service period, number of service /conception and conception rate. It could be concluded that partial replacement of yellow corn grains by discarded dates at the level of 66% as a source of energy in concentrate feed mixture improved the feed intake, digestibility, rumen fermentation activity, yield and composition of milk, economic feed efficiency as well as the post-partum reproductive traits in Friesian cows.

Keywords: Cows, discarded dates, digestibility, rumen, milk, reproduction.

INTRODUCTION

Feed is the most important cost items for livestock production. Feed cost represented 50 to 70% of the total cost of livestock production (Tayler and Field, 1998). On global scale (2009), 1.15 million h have been planted with date palm trees with average yield being about 6.52 t/h. The annual production of dates in Egypt is estimated by 1,373,570 ton (FAO, 2011), with

significant amount of cull dates annually are available in Egypt, which can be utilized as a cheap non-conventional ingredient in ruminant diets. Definitely, the quantity of cull dates is estimated by about 20% of all dates production (Al-Yousef *et al*., 1994).

Discarded dates are characterized by having high total digestible nutrients and being palatable for livestock (Al-Dobaib *et al*., 2009). Moreover, El-Nakhal *et al*. (1989) stated that dates contain fat comprising about 14 types of fatty acids and also contain 15 types of salts and minerals, protein with 23 different amino acids, six vitamins and a high percentage of dietary fiber. Date waste contains carbohydrates and minerals and is a good source of energy, thus it may be possible to use as a rich energy source for ruminant rations.

The value of energy and its source in the diet largely affect the animals feed conversion efficiency (Nunes, 1994). The flesh of date contains 0.2-0.5%, while the seeds contain 7.7-9.7% oil of unsaturated fatty acids including palmatic, oleic, linolenic and linolenic acids. Oleic acid content of the seeds varies from 41.1 to 58.8%, which suggests that the seeds and date could be used as a source of oleic acid (Al-Shahib and Marshall, 2003). Whole dates contain about 15% pits and about 8-17% NDF, 6-11% ADF and 6-8% ADL (El-Deek *et al*., 2010). Dry matter content is ranged between 75 and 95% of the whole dates, being highly negative correlation with sugar content (Boudechiche *et al*., 2008). Pitted dates and date pulp have a similar content of all nutrients, except for a lower fiber content (<6% DM; Williams, 1978).

The high sugar content of dates and date pulp make them to serve as good energy sources for livestock (Alhomidy *et al*., 2011; El-Gasim et *al*., 1986). Many animal herd owners in different countries that producing dates are using discarded dates as a supplement to their animals feed. It is the high time to use local unconventional sources of feed to fill the gap between demand and supply of the limited feed resources and to substitute the conventional high priced imported sources (Almitairy *et al*., 2011).

Feeding isonitrogenous diet including a reasonable level of discarded dates had no negative effects on milk yield and composition of Aradi goats (Al-Dobaib *et al*., 2009). The presence of steroid compounds in date pits, notably estrone, progesterone and estriol, had been known, though the actual effects of these compounds on sheep growth and reproduction have yet to be clearly demonstrated (Barreveld, 1993; El-Gasim *et al*., 1995; El-Din *et al.,* 2001). Therefore, information on the effect of dates on lactating cows is limited. So, the main objective of the this study was to investigate the effect of different levels of discarded dates to replace yellow corn grain in concentrate feed mixture on, feed intake, digestibility, rumen fermentation, milk production, economic feed efficiency and post-partum reproductive traits of lactating Friesian caws.

MATERIALS AND METHODS

This study was conducted at Sakha Animal Production Research Station, Kfrelsheikh governorate, Animal Production Research Institute (APRI), Ministry of Agriculture, Egypt during the period from January 2014 to May 2014.

Twenty lactating Friesian cows with 550 kg ±18 as average live body weight , and from 2nd to 5th party were used in this study starting from one week postpartum up to 120 days postpartum. Cows were assigned randomly to four similar groups (5 in each) according to milk production, parity and live body weight. Levels of partial and whole replacement of yellow corn grains (YCG) in concentrate feed mixture (CFM) by discarded dates (DD) were 0, 33, 66 and 100% (w/w) for the 1st (R1, control), 2nd (R2), 3rd (R3) and 4th (R4) rations, respectively (Table 1).

Cows were individually fed the experimental rations consisting of 40% CFM plus 40% berseem and 20% rice straw based on DM. The CFM consisted of 28% yellow corn, 35% undecorticated cotton seed cake, 32% wheat bran, 3% molasses, 1% limestone and 1% common salt. Cows were fed to cover the recommended requirements for lactating cows according to NRC (2001) and adjusted weekly according to milk yield change.

The CFM was offered twice daily at 8 a.m. and 4 p.m., while berseem was offered once daily at 10 a.m. and rice straw offered twice daily at 2 and 5 p.m. Drinking water was free available all the day round. Cows were free from any disease with normal healthy appearance and housed under open sheds.

Table (1): Formulation of different concentrate feed mixtures.

Ingredients (%)	CFM1 (R1)	CFM2 (R2)	CFM3 (R2)	CFM4 (R4)
Yellow corn grains	28	18.67	9.33	-
Discarded dates	-	9.33	18.67	28
Undecorticated cotton seed cake	35	35	35	35
wheat bran	32	32	32	32
molasses	3	3	3	3
Common salt	1	1	1	1
limestone	1	1	1	1
Total	100	100	100	100

Cows were mechanically milking and the morning and evening milk yields were recorded daily for each cow and then 4% FCM for each cow was calculated from daily actual milk yield and the percentage of milk fat using the formula given by Gains (1928) as follows:

4% FCM = [0.4 x milk yield (kg)] + [15 x fat yield (kg)].

Milk samples from the consecutive evening and morning milking were taken from each cow biweekly and mixed in proportion to milk yield. Milk was analyzed for fat, protein, lactose, solids not fat (SNF) and total solids (TS) by milko-scan (Model 133B).

Four digestibility trials were carried out during the feeding trial using three cows from each group to determine the nutrient digestibility coefficients and nutritive values of the experimental rations using acid insoluble ash (AIA) as an internal natural marker as described by Van Keulen and Young (1977). Feces samples were taken from the rectum of each cow in each group twice daily at 8 a.m. and 6 p.m. for 7-d collection period. Representative samples of feed and feces were taken for proximate analysis of DM, CP, CF, EE and ash according to AOAC (1990).

Rumen liquor samples were collected from three cows in each group using a rubber stomach tube connected with drawing automatic machine. Samples were collected before and 3 hours after the morning feeding and then strained through double layers of cheesecloth. Ruminal pH value was determined directly using a digital pH meter, while ammonia–N (NH3-N) concentration was determined using magnesium oxide (MgO) as described by AOAC (1990). Total volatile fatly acids (TVFA's) concentration was determined by steam distillation method as described by Warner (1964).

At the end of digestibility trials, blood samples were collected into heparinized vacationed tubes from the jugular vein of 3 cows in each group 3 h post-feeding. Then, samples were centrifuged for 15 minutes at 4000 rpm to obtain the plasma that was kept at -20 Cº till analysis. Concentration of glucose, total proteins, albumin, globulin (by difference) and total lipids, as well as activity of transaminases (AST and ALT) was determined calorimetrically in blood plasma using commercial kits (Diagnostic system laboratories, I NC, USA).

Reproductive parameters over the periods from calving to first estrus and first service, service period, days open, number of services per conception and conception rate were recorded.

Feed utilization efficiency was determined as the amounts of DM, TDN and DCP required for producing 1 kg 4% FCM. Economic feed efficiency was calculated according to the following formula:

Economic feed efficiency = Price of daily milk yield/ Daily feed cost

Where: price of 1 ton; CFM1= 2750 L.E., CFM2 = 2634.5 L.E., CFM3 = 2518.7 L.E., and CFM4 = 2400 L.E.. Yellow corn grains = 2250 L.E/ton, discarded dates = 1000 L.E./ton, berseem = 230 L.E/ton, rice straw = 330 L.E/ton and price of 1 kg 4% FCM = 3.35 L.E.

Data were subjected to statistical analysis using General Linear Models procedure adapted by SPSS for windows (2008) for user's guide with one-way ANOVA. Duncan test within program SPSS was done to determine the degree of significance between the means at $P<0.05$ (Duncan, 1955).

RESULTS AND DISCUSSION

Chemical composition:

Results of chemical composition presented in Table (2) showed that the contents of OM, CP and NFE decreased , while contents of CF and ash increased by increasing level of replacing yellow corn grains (YCG) with discarded dates (DD). These results are in agreement with those reported by Herms and Al-Homidan (2004), Al-Dabeeb (2005) and Allam *et al*. (2013).

Presumably, this nutrient contents of all rations seemed to be most suitable for dairy cows.

Table (2): Chemical composition of feedstuffs, concentrate feed mixtures and the experimental rations.

Item	DM%	Chemical composition (on DM basis, %)					
		OM	CP	CF	EE	NFE	Ash
Yellow corn grain	88.72	97.85	9.14	2.67	4.12	81.92	2.15
Discarded dates	85.26	86.46	5.12	9.18	4.43	67.73	13.54
Berseem	15.45	88.41	16.31	25.03	1.36	45.71	11.59
Rice straw	89.78	82.97	2.92	36.11	1.13	42.81	17.03
CFM1	91.45	92.08	16.62	12.76	3.53	59.17	7.92
CFM2	91.13	90.92	16.34	12.95	3.68	57.95	9.08
CFM3	90.62	89.78	16.17	13.32	3.58	56.71	10.22
CFM4	89.56	88.69	15.97	13.64	3.47	55.61	11.31
Experimental rations (Calculated)							
R1	34.36	88.14	12.46	23.82	2.09	49.78	11.86
R2	33.88	88.15	13.09	22.63	2.28	50.15	11.85
R3	35.22	87.67	12.98	22.72	2.26	49.72	12.33
R4	33.39	87.02	12.52	23.83	2.08	48.59	12.98

Digestibility trails:

Results in Table (3) showed that R3 (66% DD) recorded significantly ($P<0.05$) the highest digestibility coefficients of DM, OM, CP, CF, EE and NFE, while the lowest values were associated with control (R1). The digestibility coefficients of R2 and R4 were just slightly higher than those of control one. Similar trend was observed by many researchers who reported that the improvement in digestion coefficients could be due to the high energy value of dates as that of cereal grains such as barley for instance. In this respect, El-Hag *et al*. (1993) reported that high inclusion of dates in ration caused a sharp drop in digestion coefficients of CP and CF. The same trend was observed by Al-Yousef *et al*. (1994). Therefore, the main limitation of dates is their low protein content and hence protein supplementation is required when dates are included at high levels in the diet (Rihani *et al.,* 1988). In supporting to the present results, Ahmed and Al-Dabeeb (2000) indicated that date supplemented diets may markedly improve the digestibility coefficients of nutrients and in turn the feeding value of diets. Nutritive values expressed as TDN and DCP had followed the same trends of digestibility of nutrients among treatments.

These results revealed that R3 seemed to be the best dietary treatment for the combination between the yellow corn grains and discarded dates, which showed significant increase as compared to the control ration (R1). These results agreed with those obtained by Abd El-Rahman *et al.* (2012), who found that the TDN value of 100% cull dates replacement of yellow corn grains was insignificantly higher than that of other levels of replacement.

Table (3): Digestibility coefficients and nutritive values of experimental rations.

Item	Experimental group				SEM
	G1 (R1)	G2 (R2)	G3 (R3)	G4 (R4)	
Digestibility coefficients %					
DM	61.01^{b}	62.60^{ab}	63.55^{a}	61.65^{ab}	0.29
OM	62.92^{b}	64.55^{ab}	65.54^{a}	63.57^{ab}	0.30
CP	65.79^{b}	67.50^{ab}	68.53^{a}	66.47^{ab}	0.31
CF	60.06^{b}	61.62^{ab}	62.56^{a}	60.68^{ab}	0.29
EE	72.07^{b}	73.94^{ab}	75.07^{a}	72.82^{ab}	0.34
NFE	68.41^{b}	70.19^{ab}	71.26^{a}	69.12^{ab}	0.33
Nutritive values (%, DM)					
TDN	59.94^{b}	61.77^{ab}	62.35^{a}	59.78^{ab}	0.34
DCP	8.20^{b}	8.84^{ab}	8.89^{a}	8.32^{ab}	0.09

a and b: Means in the same row with different subscripts differed significantly (P<0.05).

Feed intake:

Average daily feed intake by cows fed the tested rations are presented in Table (4). Intake of CFM was higher for cows fed R3, followed by cows fed R2 and R4, while cows fed R1 showed the lowest CFM intake. These results are in line with that mentioned by El-Hag *et al*. (1993) and El-Gasim *et al*. (1986), who found that adding discarded dates in diets of Awassi lambs increased feed intake. This reduction could be attributed to the palatability of the discarded dates-rations. Berseem intake was higher for cows fed on discarded dates-rations than the control cows. However, the intake of rice straw by cows fed R3 was lower than that of the other cow groups.

The marked differences in the amount of intake from CFM, berseem and rice straw were certainly attributed to the variations in milk yield among the the experimental groups. At the same time, the differences in the amount of intake from CFM, berseem and rice straw reflect differences in intake of DM, TDN and DCP , being the highest for cows fed R3, followed by cows fed R2 and R4, while those fed R1 had the lowest intake (Table 4).

These results agreed with those obtained by Almitairy *et al*. (2011), who showed that daily feed intake was significantly (P<0.05) higher from 30% discarded dates diet than those of zero or 15%,in replacing the commercial concentrate mixture with Najdi male lambs. Also, Abd El- Rahman *et al.* (2012) reported that the DM intake of 100% replacement of yellow corn by the cull date in the ration was higher than that of other tested rations of goat kids.

Table (4): Average daily feed intake by cows fed the experimental rations.

Item	Experimental group				SEM
	G1 (R1)	G2 (R2)	G3 (R3)	G4 (R4)	
As fed (kg):					
CFM	6.80	8.60	9.40	7.60	-
Berseem	37.00	41.00	42.00	42.00	-
Rice straw	5.60	5.60	5.00	5.40	-
As DM (kg)					
Total DM	16.96^{c}	18.66^{ab}	19.86^{a}	18.32^{b}	0.31
TDN	10.17^{c}	11.53^{b}	12.38^{a}	10.95^{b}	0.22
DCP	1.39^{d}	1.65^{b}	1.77^{a}	1.52^{c}	0.04

a, b, c, d: Values in the same row with different superscripts differed significantly (P<0.05).

Rumen fermentation:

Rumen fermentation parameters of cows fed experimental rations are presented in Table (5). The pH values in rumen liquor before feeding was nearly similar in all groups. Post-feeding, ruminal pH values markedly decreased by increasing level of discarded dates in the tested rations with significant differences as compared to the control (R1). However, the differences among discarded dates-diets were insignificant. The decreased pH values with increasing the levels of DD in tested rations was probably due to the quicker fermentation of DD-diets in the rumen than the YCG ones. This result is in agreement with those obtained by Awadalla *et al*. (2002), who reported that rumen pH decreased (P<0.05) by increasing the levels of ground dates in the rations. Also, Kholif *et al.* (1996) reported significant decreases in rumen pH with ground dates inclusion in goat rations.

Concerning the concentration of total volatile fatty acids (TVFA's) in rumen liquor, only R2 ration caused a significant reduction in concentration of TVFA's before feeding compared with the control one (R1), while other rations did not influenced significantly.

Table (5): Rumen fermentation activity of cows fed experimental rations.

Item	Experimental group				SEM
	G1 (R1)	G2 (R2)	G3 (R3)	G4 (R4)	
Ruminal pH value:					
Before feeding	6.87	6.96	7.07	7.01	0.04
After feeding	6.60a	6.04b	5.91b	5.87b	0.09
Concentration of TVFA's (ml equiv./100 ml):					
Before feeding	4.18a	2.82b	3.20ab	3.98ab	0.23
After feeding	7.76c	8.68bc	12.44a	10.07b	0.58
Concentration of NH_3-N (mg/100 ml):					
Before feeding	12.12b	12.66b	14.33a	11.12c	0.58
After feeding	24.04c	25.49b	27.75a	25.16b	1.35

a, b, c, d: Values in the same row with different superscripts differed significantly (P<0.05).

After feeding, the situation was changed where R3 significantly (P<0.05) ranked the highest TVFA's concentration then R4 and R2, while R1 showed the lowest one. In addition, the concentration of TVFA's increased after feeding with inverse relation to pH value in rumen liquor (Table 5).

Ammonia-nitrogen concentration in rumen liquor of cows fed R3 (66% DD) was significantly (P<0.05) higher before and after feeding than those of other groups. Cows fed R4 had significantly (P<0.05) the lowest concentration before feeding and those fed R1 had the lowest concentration after feeding (Table 5).

These results agreed with those obtained by Abd El-Rahman *et al*. (2012), who reported that the decreased ruminal pH that associated with ground dates ration was partially a result of higher concentration of total VFA's concentration. Also, they added that the increase in rumen NH3-N concentration due to supplementation of ground date might be considered as an indicator for high ruminal activity, which was in turn reflect on higher digestibility and ruminal total volatile fatty acids values in goat kids fed 100% cull dates than control group.

Blood parameters:

Results I Table (6) revealed that total proteins, albumin, globulin and total lipids concentrations and activity of AST showed inconsistent trend of differences among the experimental groups The obtained results are also ambiguous and inconclusive. Therefore, such discriminations among treatment might be due to other factors alongside with the partial effects of experimental treatments.

Table (6): Blood plasma parameters of cows fed experimental rations.

Item	Experimental group				SEM
	G1	G2	g3	G4	
Total protein (g/dl)	7.03^{a}	6.67^{b}	7.23^{a}	6.33^{b}	0.11
Albumin (g/dl)	3.08^{a}	2.99^{a}	2.77^{b}	3.13^{a}	0.05
Globulin (g/dl)	3.95^{b}	3.68^{b}	4.46^{a}	3.21^{c}	0.15
Glucose (mg/dl)	35^{b}	37^{b}	45^{a}	48^{a}	1.53
Total lipids (mg/dl)	571^{a}	487^{ab}	421^{b}	522^{a}	19.88
AST (IU/L)	53.33^{ab}	58.33^{a}	55.50^{ab}	50.67^{b}	2.70
ALT (IU/L)	27.00	27.33	30.00	31.00	1.35

a, b….d: Values in the same row with different superscripts differed significantly (P<0.05).

Glucose concentration increased with increasing the levels of DD in the tested rations, being significantly (P<0.05) higher in G3 and G4 than in G1 and G2. However, ALT activity showed insignificant increase by increasing DD in concentrate feed mixture. The activities of both AST and ALT within the normal range as detected by Kaneko (1997), being 70 and 40 IU for AST and ALT, respectively. The present results are in contrast with those obtained by Abdel-Fattah *et al.* (2012), who found that inclusion of ground dates palm in concentrate feed mixture caused slightly increase in blood total protein concentration.

Milk production:

Milk yield and composition of cows as affected by the level of replacing yellow corn grain by discarded dates in concentrate feed mixture are presented in Table (7). The daily yield as actual milk or 4% FCM significantly ($P<0.05$) increased by increasing the level of DD up to 66% (G3) and decreased with 100% DD replacement with YCG (G4), despite the differences between g4 and G1 was significant ($P<0.05$). Cows in G3 (66% DD) showed significantly ($P<0.05$) the highest daily yield of actual and 4% fat corrected milk being 20.17 and 19.08 kg/day respectively, while cows in G1 (0% DD) had the lowest values (14.33 and 12.60 kg/day, respectively).

Average daily actual milk yield of G2, G3 and G4 increased by 21.14, 31.57 and 12.07% as compared to G1, respectively. The corresponding values of 4% FCM were 20.10, 41.54 and 11.05%, respectively. These results are in harmony with those obtained by Allam *et al*. (2013), who indicated that discarded dates can be incorporated into the rations of ruminant animals replacing all or part of maize grains and therefore those results could be favorably reflected on both national economy and provide an outlet for date sector. Similarly, Khattab (2013) found that DM intake and body weight changes and milk yield were not significantly affected when lactating Barki ewes were fed diets of 0, 50 or 100% from dates in replacing corn grains.

Table (7): Average daily milk yield, milk composition and milk constituents yield of cows fed experimental rations.

Item	Experimental group				SEM
	G1	G2	G3	G4	
Average daily milk yield, kg/h/d					
Actual milk	15.33^{d}	18.57^{b}	20.17^{a}	17.18^{c}	0.21
4% FCM	13.48^{d}	16.19^{b}	19.08^{a}	14.97^{c}	0.23
Milk composition, %					
Fat	3.19^{b}	3.15^{b}	3.63^{a}	3.15^{b}	0.03
Protein	2.48^{c}	2.84^{a}	2.85^{a}	2.71^{b}	0.02
Lactose	4.56^{a}	4.42^{ab}	4.33^{b}	4.39^{ab}	0.03
Solids not fat	7.74	7.94	7.85	7.78	0.04
Total solids	10.93^{b}	11.08^{b}	11.49^{a}	10.93^{b}	0.05
Ash	0.70^{a}	0.68^{ab}	0.67^{b}	0.68^{ab}	0.005
Milk constituents yield, kg					
Fat	0.49^{c}	0.58^{b}	0.73$_{a}$	0.54^{b}	0.01
Protein	0.38^{d}	0.53^{b}	0.58^{a}	0.47^{c}	0.01
Lactose	0.70^{b}	0.82^{a}	0.88^{a}	0.75^{b}	0.01
Total solids	1.68^{d}	2.06^{b}	2.32^{a}	1.87^{c}	0.03

a, b….d: Values in the same row with different superscripts differed significantly ($P<0.05$).

Regarding the chemical composition of milk (Table7), there were significant differences ($P<0.05$) in the percentages of fat, protein and total solids in milk between G3 (the highest one) and each of G1, G2 and G4, but

the differences were not significant. Milk lactose and ash contents have the same trend among groups and both values did not significantly differed among groups but both values of G3 were lower significantly than those of G1. Percentage of solids not fat was insignificantly different among the different groups. The yield of milk constituents had similar trend to milk yield in which cows in G3 showed significantly (P<0.05) the highest yield of fat, protein, lactose and total solids, while G1 had the lowest values.

These results are in matching with those obtained by AL-Dobaib *et al*. (2009), who found milk obtained from Aradi goat does receiving discarded dates was significantly higher in protein and solids not fat contents, but the other milk constituents were not different.

Reproductive traits:

The effect of the level of replacing yellow corn grain by discarded dates in concentrate feed mixture on reproductive performance are presented in Table (8). Cows in G3 recorded significantly (P<0.05) the shortest intervals from calving to first estrus (27.2 d) and first service (45.4 d), while cows in G2 had the longest intervals (36.6 and 61.2 days, respectively). However, cows in G3 showed significantly (P<0.05) the longest service period (52.4 d), while the short period was in G1 (24 d). At the same time, cows in G2 revealed significantly (P<0.05) the highest number of days open (102 d) and G1 had the lowest one (85.2 d). Cows in G4 recorded significantly (P<0.05) the highest number of services per conception (2.4 serv.), but cows in G2 and G3 had significantly (P<0.05) the lowest numbers (1.8). Moreover, conception rate was significantly (P<0.05) higher in G3 (100%) compared with the other groups (80%, Table 8).

Table (8): Reproductive traits of cows in the experimental groups.

Item	Experimental group				SEM
	G1	G2	G3	G4	
First estrus (day)	36.6^{b}	41.4^{a}	27.2^{c}	34.2^{b}	0.66
First service (day)	61.2^{b}	69.0^{a}	45.4^{c}	56.6^{b}	1.48
Service period (day)	24.0^{d}	33.0^{c}	52.4^{a}	44.0^{b}	2.37
Days open (day)	85.2^{c}	102.0^{a}	97.8^{a}	100.6^{a}	1.77
No. services/conception	2.0^{ab}	1.8^{c}	1.8^{c}	2.4^{a}	0.05
Conception rate (%)	80^{b}	80^{b}	100^{a}	80^{b}	2.19

a, b and c : Values in the same row with different superscripts differed significantly (P<0.05).

The observed improvement in reproductive performance with discarded dates at a level of 66% (G3) may be attributed to the higher unsaturated fatty acids in dates as presented by Al-Shahib and Marshall (2003), who found that the flesh of date contains 0.2-0.5% oil, and seeds contain 7.7-9.7% oil with high content of unsaturated fatty acids which including palmatic, oleic, linolenic and linolenic acids. The oleic acid content of the seeds varies from 41.1 to 58.8% which in turn could be considered used as a source of oleic acid.

Feed utilization:

Results in Table (9) showed significant (P<0.05) differences mostly between 66% (G3) and control one (G1) in respect of feed efficiency expressed as the amounts of DM, TDN and DCP required to produce one kg 4% FCM. Cows in G3 showed the best feed efficiency (DM,TND or DCP:4%-FCM) followed by those in G2 and G4, while those in G1 had the poorest values. However, the values of G1, G2 and G4) were approximately close. These results might be attributed to the differences in the yield of actual and 4% FCM (Table 6) and agreed with the findings of Abd El-Raman *et al*. (2012), who reported that replacement of yellow corn by cull dates led to an improvement in growth rate compared with the control group that free from cull dates. Moreover, the present results are comparable with those recognized by El-Hag *et al*. (1993).

Economic feed efficiency:

Concerning the results of economic efficiency in Table (7), average daily feed cost was significantly (P<0.05) higher for cows fed R2 and R3 in compared to those fed R1 and R4. However, cows fed R3 showed the lowest feed cost/ kg 4% FCM followed by those fed R4 then R2, while those fed R1 had the highest value with significant differences between R1 and each of R3 and R4. Moreover, cows fed R3 showed the highest price of average daily yield of 4% FCM followed by those fed R2 then R4, while those fed R1 had the lowest value. Also economic efficiency expressed as the ratio between the price of average daily yield of 4% FCM and the average daily feed cost was the highest for cow fed R3 followed by those fed R4 then R2, while those fed R1 had the lowest value.

Table (9): Feed and economic efficiency of experimental rations.

Item	Experimental group				SEM
	G1 (R1)	G2 (R2)	G3 (R3)	G4 (R4)	
Feed efficiency:					
DM (kg/kg 4% FCM)	1.26^{a}	1.15^{b}	1.04^{c}	1.22^{ab}	0.02
TDN (kg/kg 4% FCM)	0.76^{a}	0.71^{a}	0.65b	0.73^{a}	0.01
DCP (g/kg 4% FCM)	103.29^{a}	101.90^{a}	92.48^{b}	101.85^{a}	1.40
Economic efficiency					
Feed cost (L.E.)	29.06^{b}	33.93^{a}	34.98^{a}	29.68^{b}	0.71
Feed cost (L.E.)/kg 4% FCM	2.16^{a}	2.10a^{b}	1.83^{c}	1.98^{bc}	0.04
Price of 4% FCM yield/d (LE)	45.14^{d}	54.25^{b}	63.90^{a}	50.15^{c}	1.61
Economic efficiency	1.56^{b}	1.60^{b}	1.83^{a}	1.69^{b}	0.03

a, b, c, d: Values in the same row with different superscripts differ significantly (p<0.05).

Similar results were obtained by Abd El-Raman *et al*. (2012) who replaced yellow corn with cull dates as a source of energy in ration of goats kids. From economic point of view, Khattab (2013) demonstrated that the replacement of corn grain with dates will reduce the cost of concentrate mixture components of sheep diet by about 24%, which benefit poor farmers

who unable to purchase concentrated feed for their animal. Moreover, Kewan (2013) concluded that the replaced DD with corn grain can be successfully used in feed sheep with similar effect on their growth performance and carcass traits for Barki lambs and moreover breeders earned high gross margin.

CONCLUSION

From these results it could be concluded that partial replacement of yellow corn grains by discarded dates at the level of 66% as a source of energy in concentrate feed mixture improved the feed intake, digestibility, rumen fermentation activity, yield and composition of milk, economic feed efficiency as well as the post-partum reproductive traits in Friesian cows.

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تأثير استخدام البلح الفرز علي الاداء الانتاجي والتناسلي لأبقار الفرزيان الحلابة

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استخدمت فى هذه الدراسة ٢٠ بقرة فرزيان حلاب بمتوسط اوزن ٥٥٠ كيلو جرام وزن حى مابين الموسم الثانى الى الخامس لدراسة تاثيراستبدال مستويات مختلفة من حبوب الذرة الصفراء بالبلح الفرز (صفر -٣٣ – ٦٦ و ١٠٠% فـى مخلـوط العلـف المركـز (ع١ – ع٢ – ع٣ و ع٤ علـى الترتيـب) علـى الاداء الانتاجى والتناسلي٠ واظهرت النتائج التى:

١- كانت المادة العضوية والبروتين الخام والمستخلص الخالى من الازوت أعلى فى حبوب الذرة مقارنة بالبلح الفرز الذى كان أعلى فى محتواه من الالياف الخام والرماد من الذرة٠

٢- سجلت الابقار الغذاه على العليقة الثالثة (ع٣) ارتفاع معنوى فى جميع معاملات الهضم والقيم الغذائية والماكول من المادة الجافة والمركبات الغذائية المهضومة والبروتين الخام المهضوم وتلتها االعليقة الثانية ثم الرابعة بينما سجلت عليقة الكنترول اقل القيم٠

٣- انخفضت درجة حموضة الكرش بعد الاكل وسجلت العليقة الرابعة فروق معنوية عالية مقارنة بباقى العلائق٠

٤- ارتفع تركيز الاحماض الدهنية الطيارة الكلية معنويا فى سائل الكرش للابقار التى تغذت على العليقه الاولى قبل الاكل وفى الابقار التى تغذت على العليقة الثالثة بعد الاكل بينما كان اقل تركيز للاحماض الدهنية الكلية للابقار التى تغذت على العليقة الثانية قبل الاكل والعليقة الاولى بعد الاكل وزاد تركيز الاحماض الدهنية الكلية بعد الاكل مع وجود علاقة عكسية مع درجة الحموضة فى سائل الكرش٠

٥- سجلت الأبقار المغذاه على العليقة الثالثة أعلى تركيز لنيتروجين الأمونيا في سائل الكرش قبل وبعد الأكل٠

٦- اظهرت الابقار التي تغذت علي العليقة الثالثة ارتفاع في تركيز البروتين الكلي والجلوبيولين والجلوكوز وانخفاض في تركيز الالبيومين والدهون والكلية في بلازم الدم٠ بينما ارتفع شاط AST في بلازما الدم للابقار التي تغذت علي العليقة الثانية بينما لم يتاثر نشاط ALT معنويا٠٧- اظهرت الابقار في المعاملة الثالثة ارتفاع معنوي في الانتاج اليومي للبن واللبن المعدل لنسبة الدهن وكذلك مكونات اللبن عن المعاملة الثانية والرابعة بينما ابقار المعاملة الاولي اظهرت اقل القيم٠

٨- حققت ابقار المعاملة الثالثة ارتفاعا معنويا في النسبة المئوية للدهن والبروتين والجوامد الصلبة في اللبن، بينما لوحظ ارتفاع في النسبة المئوية في سكر اللبن والرماد في ابقار المعاملة الاولي (الكنترول)٠

٩- اظهرت الابقار في المعاملة الثالثة انخفاض في المادة الجافة المأكولة والمركبات الكلية المهضومة والبروتين المهضوم لكل كجم لبن معدل لنسبة دهن ٤% مقارنة بباقي المعاملات٠

١٠- ارتفاع العائد الكلي من محصول اللبن المعدل نسبة الدهن ٤% والكفاءة الاقتصادية في المعاملة الثالثة تليها المعاملات الثانية والرابعة بينما اظهرت المعاملة الاولي اتجاه مضاد٠

١١- سجلت الابقار في المعاملة الثانية أقصر مدة من الولادة الي ظهور اول شياع واول تلقيحة وزيادة المدة من اول تلقيحة حتي الاخصاب٠ بينما اظهرت الابقار في المعاملة الثانية زيادة في طول المدة من الولادة حتي التلقيح والمعاملة الاولي اظهرت قصر الفترة من الولادة حتي ظهور اول شياع٠

١٢- أظهرت الابقار في المعاملة الرابعة زيادة في عدد مرات التلقيح اللازمة للاخصاب عن ابقار المعاملة الثانية والمعاملة الثالثة٠علاوة علي ذلك ارتفع معدل الاخصاب في المعاملة الثالثة مقارنة بباقي المعاملات.

من هذه الدراسة نستخلص إن الاستبدال الجزئي بمستوي ٦٦% من حبوب الذرة الصفراء بالبلح الفرز كمصدر بديل للطاقة في مخلوط العلف المركز أدي إلي تحسن الغذاء المأكول، الهضم، نشاط تخمرات الكرش، أنتاج اللبن وتركيبه، الكفاءة الغذائية والاقتصادية وكذلك صفات التناسل بعد الولادة في أبقار الفرزيان٠

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