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EFFECT OF SUBSTITUTION OF YELLOW CORN BY DISCARDED DATES ON PRODUCTION PERFORMANCE AND DIGESTION COEFFICIENTS OF LACTATING BARKI EWES

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SUMMARY

Dates that have been discarded are rich and inexpensive source of energy and represent a promising replacement for costly concentrates in livestock feeding. This research evaluated the impact of increasing levels of discarded dates as a substitute for yellow corn grain on intake, nutrient digestibility, and performance of lactating Barki ewes. Twenty multiparous lactating ewes (38.2 kg ± 1.18) were randomly divided into four groups (five ewes per group). The feeding trial lasted for 60 days, followed by the digestion trials. Ewes were fed a diet of concentrate feed mixture and fresh berseem clover at 70:30 on dry matter basis. Discarded dates (DD) were introduced at levels of 0, 25, 50, and 75% as a replacement for corn grain (CG) in the concentrated feed mixture (CFM) of the experimental groups (R1; control, R2, R3, and R4), respectively. Replacement of CG with DD affected the chemical composition of the ration, resulting in an increase in crude fiber content and a decrease in crude protein content. However, DD had no influence on dry matter intake, nutrient digestibility coefficients, or nutritive values (TDN, DCP, and SE). Increasing the inclusion level of DD led to a significant improvement in digestible crude fiber content and a decrease in digestible N-free extract content. Actual daily milk yield and energy corrected milk were unaffected by DD. However, ewes fed on DD at 75% numerically produced less milk yield and milk constituent yields. Also, there was no significant effect of DD on ewes' BW or lambs' average daily gain. In conclusion, discarded dates can serve as an alternative energy resource for feeding lactating ewes up to 75% of yellow corn without any adverse effect on the animals' performance.

Keywords: *discarded dates, yellow corn, digestibility, milk, and Barki ewes.*

INTRODUCTION

Feeding costs account for 50-70% of the overall cost of animal production. Corn grains are the most important sources of carbohydrates in the diets of ruminants. One solution to the shortage and high price of corn grains is to use non-conventional substances as a partial or complete substitute for corn grains in the diets of ruminants (Taylor and Field, 2014). Egypt is a leading producer of dates and is considered to be one of the most significant date-producing nations in the world (FAO, 2011). Egypt produces over 1.4 million tons of dates each year, and the quantity of cull dates accounts for approximately 20% of all dates produced (Al-Yousef *et al*., 1994). Dates are rich in sugar, particularly glucose and fructose, which make up 60 to 76% of DM. Dates may provide animals with 87% of the digestible energy of the same quantity of traditional feed grain (El-Diahy *et al*., 2016). However, dates have a low protein concentration (1.5-4% of DM) compared to corn grains (Boufennara *et al*., 2016). Feeding sugar is preferable to feeding starch because sugar is immediately transformed into glucose with minimal nutritional loss (Chamberlain *et al*., 1993). Discarded dates are a valuable source of energy and might be added to ruminant animal feeds in replacement of imported corn grains, benefiting both the national economy and the date industry (Abo-Donia *et al*., 2019; El-Diahy *et al*., 2016; Iqbal *et al*., 2019; Shi *et al*., 2014; Suliman and Mustafa, 2014; Zadeh *et al*., 2015). Discarded dates are not suitable for human consumption, but they contain high quantities of total digestible nutrients and are palatable to ruminants. Dry matter intake (DMI) was significantly higher in animals fed discarded dates compared to a control diet (Iqbal *et al*., 2019). However, Abo-Donia *et al*. (2019) reported that no significant increase in DMI was observed by dairy cows fed discarded dates. Also, no significant differences in DMI were found in sheep and lactating ewes fed discarded dates (Khattab, 2013; Khattab and Anele, 2022). Numerous studies have investigated the influence of discarded dates on nutrient digestion (Al-Yousef *et al*., 1994; Iqbal *et al*., 2019; Khattab *et* *al*., 2013; Khattab and Anele, 2022; Shi *et al*., 2014; Taghinejad ‐ Roudbaneh *et al*., 2015; Zade *et al*., 2014). Khattab and Anele (2022) reported that the digestibility of organic matter (OM), crude protein (CP), and neutral detergent fiber (NDF) were increased linearly ($p<0.05$) with increasing levels of dates, whereas the digestibility of dry matter (DM) tended to improve. Moreover, Iqbal *et al*. (2019) observed significant improvements in the *in vitro* DM digestibility (IVDMD) and in vivo nutritional digestibility with an increasing percentage of discarded date palm, up to 30%. In contrast, Shi *et al*. (2014) reported a significant decline in the digestibility of DM, CP, NDF, and ADF with an increasing proportion of non-conventional feed components in the diet.

The impact of feeding discarded dates on milk production and composition has been investigated by several studies (Abo-Donia *et al*., 2019; Allam *et al*., 2015; Iqbal *et al*., 2019; Khattab, 2013). The replacement of 0, 50, or 100% of corn grain in the diets of lactating Barki ewes with dates had no significant effect on milk production or composition (Khattab, 2013). Similarly, Abo-Donia *et al*. (2019) reported that replacement of yellow corn grains in silage with discarded dates in crossing Friesian dairy cows' diets up to 75% had no significant impact on milk output and composition. However, Damani sheep fed 20 and 30% discarded dates on a dry matter (DM) basis produced more milk per day than those in control group. Also, milk fat, lactose, protein, and solids not fat (SNF) content were increased as the amount of dates increased in the diet (Iqbal *et al*., 2019).

Although few studies investigated the impact of feeding dates on milk production, the findings were inconsistent, and additional research is required to understand the influence of dates on lactating Barki ewes' performance. Therefore, the purpose of this research was to examine the impact of increasing quantities of discarded dates as a substitute for corn grain on intake, nutrients' digestibility, milk yield and composition of lactating Barki ewes.

MATERIALS AND METHODS

This study was carried out at the Sheep Farm, the Experimental Farm Project, Nuclear Research Centre, Atomic Energy Authority, Inshas, while the laboratory analysis was carried out in Dairy Department lab, National Research Centre, Giza, Egypt.

Experimental design, animals, and diets:

Twenty multiparous lactating Barki ewes (38.2±1.18, kg), suckling single lambs after 15 days of parturition were randomly divided into four groups (5 ewes each) using the complete random design. The feeding trial lasted for 60 days. Experimental diets consisted of a concentrated feed mixture and fresh berseem clover at 70:30 on dry matter basis. Discarded dates (DD) were introduced at levels of 0, 25, 50, and 75% as a replacement for corn grain (CG) in the concentrated feed mixture (CFM) of the experimental groups (R1; control, R2, R3, and R4), respectively. All diets were balanced and formulated to meet NRC (1975) recommendations. Ewes were fed twice daily in two equal portions. The first half of concentrate feed mixture (CFM) was offered at 09.00 and the second half at 14.00. Berseem clover was offered daily at 10.00. Animals had continuous access to fresh water. The ingredients composition (%) of the concentrated feed mixture used in the experimental groups is presented in table (1). Experimental diets were analyzed for proximate composition according to AOAC (2005). Table (2) shows the chemical composition of feed ingredients (on DM basis).

Table (1): Ingredients composition (%) of experimental concentrated fed mixture (CFM) fed to ewes.

Item	Experimental ration			
	R1	R2	R3	R4
Corn grain	50	37.5	25	12.5
Discarded dates	-	12.5	25	37.5
Sugar beet pulp	27.4	27.4	27.4	27.4
Cottonseed meal	12	12	12	12
Soya meal 48%	3	3	3	3
Wheat bran	5.0	5.0	5.0	5.0
NaCL	1	1	1	1
Mineral mixture	0.5	0.5	0.5	0.5
Dicalcium phosphate	1	1	1	1
AD_3E	0.1	0.1	0.1	0.1

Milk production and composition:

Milk yield was recorded for every ewe once every two weeks, starting from the second week until 8 weeks of lactation. Twenty-four hours before hand milking, the lambs were kept away from their dams. Ewes were completely hand milked until stripping the udder. Representative milk samples of about 100 g/ewe were taken and stored at –20°C until analysis. Milk contents of fat, protein, lactose, solids-not-fat (SNF), total solids (TS), and some physical characteristics (density, freezing point, and pH) were determined using the LACTOSCAN SP MILK ANALYZER (Milkotronic Ltd- Bulgaria). Milk SNF and ash were calculated by the following equation: SNF % = TS % - Fat %; Ash % = TS % - Protein % - Fat % - Lactose %. Milk urea nitrogen (MUN) was conducted for milk samples using commercial kits (Bio-diagnostic® kits) by colorimetric method using a spectrophotometric device (T80 UV/VIS Spectrometer, PG Instruments Ltd., UK). Daily yields of fat, protein, lactose, ash, total solids, and solids-not-fat were computed for the individual milk yields from the sampling day of each ewe.

Daily milk yield was standardized to 4% fat and 3.3% protein using the energy corrected milk (ECM) formula: ECM (kg/d) = (milk production × (0.383 × % fat + 0.242 × % protein + 0.7832) / 3.1138), (NRC, 2001).

Changes in body weight:

Ewes and lambs were weighted before the morning feeding every two weeks over the experimental period to record changes in body weight.

Digestion trail:

At the end of the lactation trial, four animals from each treatment were selected randomly for the digestion study to determine digestibility and nutritive value of the experimental rations. Animals were individually housed in a pen for 7 days as a preliminary period, followed by 4 days as a collection period. The rations were offered daily, and refusals, if found, were recorded every day. Grap samples of feces from rectum were daily collected. Fecal samples were sprayed with H_2SO_4 10% and dried at 60°C for 48 hours, then ground and stored for chemical analysis. Silica as an internal marker was used for determining the apparent digestibility. Digestibility coefficients were calculated using the following formula:

Digestion coefficient = 100 - [100 × (% indicator in feed) / (% indicator in feces) × (% nutrient in feces) / (% nutrient in feed)].

Statistical analysis:

Data were statistically analyzed using Two-Way Repeated Measures ANOVA (SPSS, 2011). The statistical model was as follows: $Y_{ijk} = \mu + R_i + Tj + (RT)_{ij} + e_{ijk}$, Where Y_{ijk} = the kth observation (k = 1… 20) for ration i in time j, μ = the overall mean, R_i = the effect of ration i (i = 1… 4), T_j = the effect of time j (j = 15, 30, 45, 60), $(RP)_{jk}$ = the interaction, and e_{ijk} = the experimental error. In addition, data on changes in body weight and daily gain were analyzed using one-way ANOVA (SPSS, 2011). The statistical model was as follows: $X_{ij} = \mu + R_i + E_{ij}$, Where: X_{ij} = the j^{th} observation (j = 1… 20) for ration i, μ = overall mean, R_i = the effect ration i (i = 1… 4), Eij = experimental error. Duncan's multiple range tests were used to test the significance of means (Duncan, 1955).

RESULTS AND DISCUSSION

Ration composition, digestion coefficients and nutritive values:

Table (2) shows the chemical composition of the experimental rations. Data show that replacing corn grain (CG) with discarded dates (DD) in ewes' rations resulted in a gradual increase in crude fiber (CF) and ash content. However, CP and N-free extract (NFE) content decreased as replacement levels increased. These results agree with those reported by El-Shora *et al*. (2014); El-Diahy *et al*. (2016) and Abo-Donia *et al*. (2019).

Table (3) shows the ewes' BW, DMI, nutrient digestibility coefficients, and nutritive values of the experimental rations. There was no significant effect of discarded dates on either DMI or DMI per metabolic body weight (BW0.75). However, ewes fed 75% DD had a numerically higher DMI compared to other groups. These findings are consistent with those of Khattab (2013), who found that feeding lactating ewes on DD as a substitution for CG at levels up to 100 g/100 g of corn grain had no significant impact on their total DMI. Also, feeding DD had no significant effect on nutrient digestibility coefficients (OM, CP, CF, EE, and NFE).

Table (2): Proximate analysis of feed ingredients (on DM basis).

Item	Concentrated feed mixture (CFM)				Berseem
	R1	R2	R3	R4	
OM	94.79	93.30	92.71	92.58	90.04
CF	10.53	12.92	15.86	17.82	32.24
CP	12.19	12.04	11.82	11.05	16.57
EE	2.92	3.40	3.32	2.75	1.63
NFE*	69.15	64.94	61.71	60.95	39.6
Ash	5.21	6.70	7.29	7.42	9.96

**NFE = OM – (CP + CF + EE)*

Table (3): Dry matter intake (DMI), digestibility coefficients, and nutritive values of the experimental rations.

Item	Experimental ration				SEM	*P* value
	R1	R2	R3	R4		
Body weight, kg	38.8	38.3	37.5	38.0	1.02	0.983
Dry matter intake (DMI, g/d)						
CFM	1089.5	973.5	1151.6	1138.6	35.81	0.297
Berseem	426.1	390.4	387.9	435.9	10.77	0.292
Total	1515.5	1363.9	1539.5	1574.5	38.79	0.240
DMI/BW$^{0.75}$	97.9	89.9	101.8	102.9	2.54	0.276
Nutrient digestibility coefficients, %						
OM	74.5	74.7	78.1	73.1	0.91	0.264
CF	54.6	57.6	67.1	63.7	2.39	0.246
CP	62.1	65.6	66.9	60.5	1.16	0.170
EE	76.0	73.3	79.7	76.1	1.14	0.294
NFE	82.1	82.0	84.2	79.2	0.73	0.108
Nutritive values, % (on DM basis)						
DCF	8.4[a]	9.9[ab]	12.7[b]	13.1[b]	0.62	0.004
DCP[2]	8.4	8.8	8.7	7.6	0.18	0.057
DEE	2.0[ac]	2.2[abc]	2.4[b]	1.9[ac]	0.06	0.005
DNEF	50.6[a]	48.0[a]	48.0[a]	44.3[b]	0.69	0.002
TDN[1]	72.0	71.6	74.7	69.4	0.89	0.221
TDN intake, g/d	1090.6	980.3	1149.2	1093.2	31.87	0.318
TDN intake/BW$^{0.75}$, g/BW$^{0.75}$	70.5	64.8	76.1	71.4	2.22	0.384
DCP intake, g/d	126.8	119.8	134.2	120.3	3.75	0.530
DCP intake/BW$^{0.75}$, g/BW$^{0.75}$	8.2	7.9	8.9	7.9	0.27	0.559
SE[3]	61.9	60.4	62.5	56.4	0.97	0.095
SE intake, g/d	938.8	828.4	961.8	889.2	28.00	0.370
SE intake/BW$^{0.75}$, g/BW$^{0.75}$	60.7	54.8	63.7	58.1	1.94	0.450

[1]*TDN (%) = digestible CP (%) + digestible CF (%) + digestible NFE (%) + digestible EE (%) × 2.25.* (NRC, 1985)
[2]*DCP (%) = CP digestion coefficient × CP (%).*
[3]*Starch equivalent (SE)= [(DCP×0.95)+(DEE+1.91)+(DCF×1)+(DNFE×1)] - (CF% × 0.56)*
[a, b, c] *Means with different superscripts in the same raw are significantly different (P<0.05); Each value of means obtained from four animals; SE: standard error.*

However, ewes fed DD at levels of 50 and 75% (R3 and R4) had a significantly higher DCF content compared to the control group (R1). In contrast, the digestible crude protein (DCP) content tends to be numerically decreased in rations containing 75% of DD (R4) (p=0.057). Also, R4 had the lowest digestible NFE (DNFE) content (p<0.05). The digestible ether extract (DEE) content of R3 was slightly higher than the control ration.

In addition, there were no significant differences in total digestible nutrients (TDN), digestible crude protein (DCP), or starch equivalent (SE) content among the experimental rations. However, ration that contain 75% DD (R3) tend to have the highest nutritive values for TDN and SE (p>0.05). Also, R3 had insignificantly higher values for daily intake from TDN, DCP, and SE (p>0.05).

El-Shora *et al*. (2014) reported that lactating Friesian cows fed 33 and 66% DD had higher nutrient digestibility of all nutrients and nutritive values (TDN and DCP) compared to control groups (p<0.05). Also, Abo-Donia *et al*. (2019) reported an insignificant increase in the digestibility of CP, CF, and fiber fractions in dairy cows fed DD in the silage at levels up to 75% replacing CG.

Milk yield and composition:

The concomitant effects of DD on milk production and composition are presented in tables (4 and 5). As seen from table (4), there was no significant effect of DD on daily milk yield or energy corrected milk (ECM). Ewes fed DD up to 50% produced approximately the same daily milk yield and ECM as the control group. However, ewes fed the highest inclusion level of DD (R4) produced less milk, at 549.0 and 647.1 g/d for daily milk yield (P=0.884) and ECM (P=0.827), respectively. These results agree with that found by Khattab (2013) who revealed no significant effect of DD on daily milk production of lactating ewes fed DD at levels 50 and 100%. However, ewes fed 100% produced insignificantly less milk production compared to the other groups. In addition, El-Shora *et al*. (2014) reported a significant increase in daily milk yield as actual milk or 4% FCM as the level of DD inclusion increased up to 66% and then decreased with 100% DD substitution. Moreover, Iqbal *et al*. (2019) found a significant increase in the daily milk yield of Damani sheep fed 20 and 30% DD on DM basis. For milk composition, ewes fed DD at a level of 50% (R3) had an insignificantly higher milk fat content compared to the other groups (p=0.579). On the contrary, the control group (R1) had numerically higher (p>0.05) values for protein, lactose, and solids non-fat (SNF) content.

Table (4): Milk yield, ECM and milk constituents of ewes fed the experimental diets.

Items	Experimental rations				SEM	*P* value		
	R1	R2	R3	R4		Trt	Time	Trt*T
Milk yield, g/d	619.3	636.9	604.5	549.0	40.91	0.884	linear (<0.001) quadratic (0.039)	0.96
ECM*, g/d	771.8	766.1	774.9	647.1	56.92	0.827	linear (0.188) quadratic (0.037)	0.733
Fat, g/kg	4.5	4.6	5.1	4.2	0.24	0.579	linear (0.646) quadratic (0.270)	0.972
Protein, g/kg	5.5	4.9	5.0	5.2	0.10	0.317	linear (0.003) quadratic (0.117)	0.941
Lactose, g/kg	5.2	4.8	4.8	5.0	0.09	0.336	linear (0.002) quadratic (0.083)	0.952
Ash, g/kg	0.9	0.8	0.8	0.8	0.02	0.322	linear (0.003) quadratic (0.115)	0.925
SNF, g/kg	11.6	10.5	10.6	11.0	0.21	0.327	linear (0.003) quadratic (0.099)	0.946
Total solids, g/kg	16.1	15.2	15.8	15.2	0.361	0.748	linear (0.068) quadratic (0.141)	0.970
MUN, mg/dl	50.3^{a}	47.8^{a}	39.8^{b}	37.4^{b}	1.20	0.004	linear (<0.001) quadratic (0.063)	0.111

**ECM (kg/d) = (milk production × (0.383 × % fat + 0.242 × % protein + 0.7832) / 3.1138), (NRC, 2001).*

Previous study conducted by Iqbal *et al*. (2019) using lactating Damani sheep fed DD showed a significant improvement in milk composition (protein, SNF, and fat contents) while lactose content remained unchanged. Increased dietary fiber may enhance the activity of fibrolytic bacteria, resulting in an increase in acetic acid production and a reduction in propionic acid levels (Visser *et al*., 1998). Acetate is the primary substrate for de novo fatty acid production. So, increasing the acetate supply to lactating animals could lead to an increase in their milk fat content (Urrutia and Harvatine, 2017). For milk constituent yields, substitution with DD had no significant effect on milk component yields. However, ewes fed the control ration (R1) produced the numerically highest (P>0.05) yields of protein, lactose, and SNF. Milk urea nitrogen (MUN) concentration was decreased (p<0.05) in groups fed DD at 50 and 75% compared to the control and R1. MUN content can reveal both the nitrogen balance in the rumen and the dietary protein supply (if a meal is too high or low in protein) (Baset *et al*., 2010; Glatz-Hoppe *et al*., 2020). The significant decrease in MUN in groups fed DD might reflect an improvement in energy and protein in the diet, leading to high production efficiency.

Table (5): Milk constituents' yields (g/day) of ewe's milk produced during the first 60 days of lactation.

Items	Experimental rations				SEM	*P* value		
	R1	R2	R3	R4		Trt	Time	Trt*T
Fat yield, g/d	28.6	29.5	31.2	23.3	2.56	0.728	linear (0.342) quadratic (0.059)	0.818
Protein yield, g/d	34.1	31.3	30.8	28.6	2.369	0.878	linear (0.494) quadratic (0.024)	0.691
Lactose yield, g/d	32.7	30.4	29.4	27.4	2.26	0.874	linear (0.555) quadratic (0.019)	0.671
SNF yield, g/d	72.1	66.5	65.1	60.5	5.00	0.876	linear (0.003) quadratic (0.099)	0.681
Total solids yield, g/d	100.6	96.1	96.2	83.8	7.3	0.861	linear (0.408) quadratic (0.028)	0.724

Live body weight of ewes:

Table (6) presents the changes in live body weight (BW) of lactating ewes and their suckling lambs along the experimental period. Results showed no significant effect for DD substitution on lactating ewes BW. However, ewes fed control diet (R1) had insignificant highest value for weight gain being, 2 kg followed by R3 then R2 (p=0.622), while R4 was lost about 0.4 kg from their BW at the end of experiment. These findings are agreed with those of Khattab (2013), who observed no significant effect of DD on the body weight of lactating ewes.

Performance of lambs:

Table (6) shows the lambs' growth performance in respect of birth weight, weaning weight, daily gain, and total gain.

Table (6): Changes in live body weight (BW) for lactating Barki ewes and their suckling lambs during the experimental period.

items	time	Experimental rations				SEM	*P* value		
		R1	R2	R3	R4		Trt	Time	Trt*T
Ewes BW, kg	At lambing	39.0	38.0	37.4	36.2	1.18	0.761	linear (0.122)	0.664
	After 60 days	41.2	38.0	39.0	36.8				
	changes, kg	2.0	0.4	1.4	-0.4	0.66	0.622		
Lambs BW, g/h/d	At birth	4.0	3.9	3.9	3.7	0.35	0.254	linear (<0.001)	0.221
	At weaning	15.6	13.8	13.4	11.8				
	Total gain, kg	11.6	9.9	9.5	8.1	0.58	0.221		
	Growth rate, g/h/d	192.7	164.3	158.3	135.0	9.72	0.221		

This metric indirectly represents milk production during the suckling or lactation period (60 days). As shown in table (6) there were no significant differences among the groups. However, the control group had the highest total gain (kg) and average daily gain (g), being 8.96 and 199.1, respectively. Khattab (2013) reported a significant decrease in the average daily gain for lambs born of ewes fed high levels of DD (100% replaced CG).

CONCLUSION

Discarded dates are a rich source of energy, and their use as a grain substitute for corn up to 75% in the diet of lactating ewes had no adverse effects on feed intake, nutrient digestibility, milk production, or milk composition.

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تأثير استبدال الذرة الصفراء بالبلح المستبعد على الأداء الإنتاجى ومعاملات الهضم فى نعاج البرقى الحلابة

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أجريت هذه الدراسة بهدف دراسة تأثير الإحلال التدريجى للبلح المستبعد محل الذرة الصفراء على الأداء الإنتاجى ومعاملات الهضم فى نعاج البرقى الحلابة. تم تقسيم عدد عشرون نعجة برقى حلابه ترضع حمل واحد بعد 15 يوم بعد الولادة بمتوسط وزن (38.2 كجم ± 1.18) عشوائياً إلى أربعه مجموعات (عدد خمس نعجات فى كل مجموعه) بإستخدام التصميم تام العشوائية. غذيت المجموعه الأولى على العليقة الكنترول والتي تتكون من مخلوط علف مركز (لا يحتوي على البلح المستبعد) والبرسيم المصرى بنسبة (30:70) على أساس المادة الجافة. تم إحلال البلح المستبعد محل الذرة الصفراء في مخلوط العلف المركز بنسبة 25، 50، 75% في علائق المجموعة الثانية، الثالثة والرابعة، على التوالي. وقد أظهرت النتائج، زيادة فى محتوى الالياف وإنخفاض فى المحتوى من البروتين مع زيادة نسبة الإحلال. كذلك عدم وجود إختلافات معنوية فى المأكول من المادة الجافة ومعاملات الهضم وكذلك القيم الغذائية (المركبات المهضومة الكلية والبروتين المهضوم ومعادل النشا) ما بين العلائق التجريبية. فى حين أن زيادة نسبة الإحلال أدت إلى زيادة فى محتوى العليقة من الالياف المهضومة وإنخفاض محتواها من الكربوهيدرات الذائبة. ولم يتأثر محصول اللبن اليومى الفعلى أو المعدل نتيجه الإحلال. بالرغم من ان النعاج المغذاة على البلح المستبعد بنسبة إحلال 75% انتجت أقل محصول لبن يومى وكذلك المحصول من مكونات اللبن وإن لم تكن الإختلافات معنوية. كذلك لم تظهر إختلافات معنوية فى وزن النعاج أو متوسط معدل الزيادة اليومية فى الحملان مابين المعاملات التجريبية. الخلاصة، يمكن إستخدام البلح المستبعد كمصدر طاقة بديل للذرة حتى مستوى 75% من نسبة الذرة فى العليقة بدون إى تأثيرات سلبية على الأداء الإنتاجى للنعاج البرقي.

الكلمات المفتاحية: *مخلفات البلح– الذرة الصفراء – الهضم – اللبن - أغنام برقى*