JKAU: Met., Env & Arid Land Agric., Sci **Vol**. **31** No. 1, pp: 55 – 63 (1444 A.H. / 2022 A.D.)
DOI:10.4197/Met.31-1.6

Response to Partial Replacement of Yellow Corn with Sub-Graded Sweet Potato Tuber as a Non-Traditional Source of Energy on the Productive and Reproductive Performance of Dairy Cows.

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Abstract*-Twenty crossbreed Friesian cows (4-5 years old), in the 2nd and 3rd season of their early lactation stage with an average live body weight of 520 kg were divided into 4 experimental groups using a two-way classification design. The first group was fed ration containing concentrate feed mixture (CFM), yellow corn, berseem hay and rice straw, while The 2nd, 3rd and 4th groups were fed ration where 33, 66 and 100 % yellow corn (YC) was replaced by sub-graded sweet potato tubers (SPT) on DM basis, respectively. No significant differences were detected between treatments for nutrients digestibility of DM, OM, CF, EE, NFE and energy digestibility. Groups that fed control and 33 % SPT were ($P < 0.05$) higher in apparent digestibility of NDF, ADF and cellulose compared with groups fed 66 and 100 % SPT. While no significant differences were observed among groups in digestibility of ADL and hemicellulose. Feeding values as TDN were not significant between treatments. But the DCP was significantly ($P<0.05$) lower with increasing the level of SPT in the rations. No significant differences were detected between treatments for total milk yield, fat, protein, total solids, solids not fat (SNF) and lactose contents with replacement SPT instead of YC. FCM, SNF and lactose yield were increased significantly ($P< 0.05$) with T1 (100 % YC) compared with T4 (100 % SPT), but T2 and T3 were not significant. Protein and TS yield were decreased significantly ($P<0.05$) with T3 and T4 compared to T1. Feeding SPT at different levels as replacement of YC had no significant effects on serum total protein (TP), albumin, globulin, A/G ratio, ALT and AST. Animals fed SPT had significantly ($P<0.05$) lower serum urea-N concentration than those fed YC. No significant differences for days of the first estrus were observed among the treatments. The intervals between calving to first behavioral estrous were 48.9, 46.26, 47.65 and 49.11 days in cows that fed rations containing 100 % YC, 33 % SPT, 66 % SPT and 100 % SPT, respectively. The days from calving to the first insemination did not significantly differ among all groups of treated cows. The number of inseminations per conception was not significantly affected by replacement SPT instead of YC as a source of energy. The pregnancy rate was measured at the end of the treatment period and the values were 90.50, 90.50, 88.66 and 88.33 % for T1, T2, T3 and T4, respectively. A higher dietary level of SPT as a replacement for corn did not affect total DMI. DMI (Kg)/milk (Kg) was increased ($p<0.05$) significantly with higher level of SPT (T4) compared with control ones, while TDN (Kg)/milk (Kg) and DCP (g)/milk (Kg) were did not affect with T2 and T4. The feeding cost of producing Kg milk was reduced by 7.46, 11.94 and 22.39% for T2, T3 and T4, respectively, compared with the control one. It is recommended that using sub-graded SPT as a source of energy and protein during the harvesting season of sweet potato in dairy cows rations at the first lactation period instead of corn grain would improve the revenue of dairy cows.

Key words: cows, sweet potato, digestibility, productive, reproductive.

INTRODUCTION

In Egypt, animal feed resources are limited which do not allow for increasing the livestock population to a level that satisfies human demands. Moreover, feed shortage is also unevenly divided between summer and winter, where in the winter season; berseem is the major forage crop covering 60 and 75 % of yearly animal requirements of energy and protein, respectively (Hathout, 1987, Dossouky and El-Nouby, 1990 and Diab, 2015). While, in the summer season, the available feeds are mainly concentrates and straw, which cover, respectively 39 % and 22 % of the local animal requirements of energy and protein (El-Sarafy, 1991). Encouraging results obtained that using crop wastes in animal diets could participate in reducing the shortage of animal feeds and subsequently increase milk and meat production.

The starchy roots and tubers produced in many tropical and subtropical areas constitute an important energy source for human and animal feeding. Sweet potato by-products and vines are one of the world's most important feed crops for animals. Its main nutritional importance has been its starch content, however, sweet potato by-products and vines can also be a source of other nutritionally important dietary factors, such as protein, vitamin A, ascorbic acid, thiamin, riboflavin and niacin (Dominguez and Ly, 1997). In Egypt, about 8000 feddans were cultivated with sweet potatoes. Their yields give about 220.000 ton tubers of sweet potato and 20.000 ton sweet potato vines (Agric. Economics, 2002). Sweet potato tuber could be used as satisfactory source of energy in rations of ruminants since it contains equal energy of corn (Morkkor et al., 1984 and Salelign and Duraisamy, 2021). In view of these facts, it seemed desirable to study the effect of using SPT as a non-traditional source of energy instead of yellow corn. Carbohydrates generally make up between 80 to 90 % of the dry weight of sweet potato roots but the uncooked starch of the sweet potato is very resistant to hydrolysis by amylase (Dominguez, 1992).

The main objective of this study is to investigate using sweet potato tubers in the ruminant rations as a non-traditional source of energy instead of yellow corn and its effect on milk production, milk composition, nutrient digestibility and reproductive performance.

MATERIALS AND METHODS

Animal and experimental design:

This study was conducted at El-Serw Experimental Station belonging to the Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture. Twenty crossbreed Friesian cows (4-5 years old), in the 2nd and 3rd season of their early lactation stage with an average live body weight of 520 kg were divided into 4 experimental groups were used in this study. The experimental cows were divided into 4 balanced groups (5 animals in each) according to their live body weight and milk yield. Each group was assigned to one of four experimental rations. The first group received a ration containing concentrate feed mixture (CFM), yellow corn, berseem hay and rice straw. The 2nd, 3rd and 4th groups received rations where 33, 66, or 100 % yellow corn (YC) were replaced by sub-graded sweet potato tubes (SPT) on DM basis. The concentrate feed mixture (CFM) and either YC or SPT were offered twice a day just before milking. The concentrate to roughage ratio was 65: 35 and berseem to rice straw was 57.14: 42.86. The amount of berseem hay, and rice straw, were divided into two equal portions and offered at 9.00 a.m. and 3.00 p.m. Animals were individually fed and adapted on their experimental rations for 7 days before starting the feeding trial that lasted 120 days. Fresh water was available at all times.

The diets were formulated to be iso-caloric and iso-nitroguens according to NRC (1988). The diets were adjusted biweekly according to body weight, milk production and milk fat percentage. Animals were machine milked two times daily at 6.00 a.m and 5.00 p.m, and individual morning and evening milk yields were daily recorded. Every two weeks, milk samples were collected from two consecutive milkings (6.00 a.m. and 5.00 p. m.), composted according to milk yield and stored at - 20 ^{o}C for analysis. Milk samples were analyzed for percentage of fat, protein, lactose, solids not fat (SNF), total solids (TS) and ash by milk SCAN 133 BN Foss Electric, Denmark.

Chemical composition:

Composite feed and fecal samples were analyzed according to A.O.A.C (1990). Chemical composition of ingredients and the experimental rations are presented in tables 1 and 2.

Digestibility trails:

At the end of feeding trials, nutrient digestibility was estimated by acid insoluble ash (AIA) according to Van Keulen and Young (1977). Fecal samples were collected for 10 days twice daily. Neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) were determined according to Goering and Van Soest (1970). Hemi-cellulose and cellulose were calculated as the difference between NDF and ADF, ADL, and orderly. Gross energy value (GE) was determined for both feed and feces by using Gallen Kump ballistic bomb calorimeter (Catalog No. CBB: 330-1010.

Blood samples and serum analysis:

Blood samples were collected at three to four days intervals after parturition until conception via the jugular vein of cows into clean-dried tubes. The serum was separated by centrifugation. The serum was cooled and kept frozen at - 20 ^{o}C until assayed for progesterone concentration. Direct Radio Immune Assay technique was performed for progesterone determination of representative samples. Kits of Diagnostics Products Corporation, Los Anglos. MSN, with ready antibody-coated tubes were used according to the procedure outlined by the manufacturer. Determination of urea-N, total protein (TP) and albumin was performed according to Fawcett and Scott (1960), Henry et al. (1974) and Doumas et al., (1971), respectively. The globulin values were obtained by subtracting the values of albumin from the corresponding values of total protein. Alanine transaminase (ALT) and Aspartate transaminase (AST) were measured calorimetrically, according to the method of Reitman and Frankle (1957).

Reproductive management:

Uterine and ovarian palpations were performed through rectum to determine the uterine involution. The palpation was performed weekly from the first week after parturition to the 1st normal cycle. Cows were observed for 30-min. period, by the same technician three times daily for signs of estrus and inseminated accordingly after 60 days postpartum. Approximately 45 days after AI, pregnancy diagnosis was carried out by rectal palpation of the uterus. Data of first observed estrus and number of services per conception were recorded for each cow. Days open were calculated for cows that were actually diagnosed as pregnant.

Statistical analysis:

Data were statistically analyzed by using the general linear model program of SAS (1997). The differences among means were tested by using Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Chemical composition and cell wall constituents:

Chemical composition of concentrate feed mixture (CFM), berseem hay, rice straw, yellow corn (YC) and sweet potato tuber (SPT) are presented in Table (1). The content of sub-graded sweet potato tuber (SPT) from CP and EE was lower compared with corn, while it had higher fiber content. Similar results were reported by Dominguez (1992) who found that the protein and fat percent of SPT was lower than that of YC, but NFE showed higher.

Table (1): Chemical composition of different ingredients composed of tested rations.

Item	*Ingredients*				
	CSM	B.H	***R. Straw***	Y. Corn	S. Potato
Chemical compositions (%)					
DM	90.50	88.00	90.00	91.00	34.00
OM	90.30	86.00	83.50	98.70	97.20
CP	17.68	13.68	3.51	8.75	6.82
CF	12.20	24.20	33.25	1.73	4.20
EE	3.21	1.80	1.80	3.65	2.10
NFE	57.21	46.32	44.94	84.57	84.08
ASH	9.70	14.00	16.50	1.30	2.80
Cell wall constituents (%)					
NDF	19.76	51.24	68.43	10.02	9.48
ADF	14.55	39.87	54.39	8.13	6.85
ADL	1.50	3.12	6.07	0.57	0.42
Cellulose	13.05	36.75	48.32	7.56	6.28
Hemicelluloses	5.21	11.37	14.04	1.89	2.63
Energy	4.04	3.36	3.65	4.21	4.20

The chemical composition and cell wall constituents of the different experimental rations did not change with using different levels of SPT (Table 2) except DM was reduced gradually with increasing SPT rations. These results might be due to the high moisture content of SPT and they are in agreement with Abo-Donia et al. (2005).

Table (2): Percentage of ingredients and chemical composition of different rations on DM basis.

Item	T1	T2	T3	T4
Ingredients (%)				
CFM	35	35	35	35
B. Hey	20	20	20	20
R. Straw	15	15	15	15
Yellow corn	30	20	10	0
Sweet potato	0	10	20	30
Chemical composition (%)				
DM	90.08	84.38	78.68	72.98
OM	90.94	90.79	90.64	90.49
CP	12.08	11.89	11.69	11.50
CF	14.62	12.86	15.11	15.36
EE	2.77	2.62	2.46	2.31
NFE	61.47	63.42	61.38	61.32
ASH	9.06	9.21	9.36	9.51
Cell wall constituents (%)				
NDF	30.40	30.35	30.30	30.24
ADF	23.66	23.54	23.41	23.28
ADL	2.23	2.22	2.20	2.19
Cellulose	21.43	21.32	21.21	21.09
H-Cellulose	6.74	6.81	6.89	6.96
Energy Mcal/kg	3.997	3.996	3.994	3.992

T1= 30 % YC T2= 20 % YC+ 10 % P T3= 10 % YC+ 20 % P T4=30 % P

Digestibility coefficients and nutritive value of the experimental rations:

Digestibility data presented in Table (3) shows that no significant differences were detected between treatments for nutrient digestibility of DM, OM, CF, EE, NFE and energy digestibility with replacement SPT instead of YC as a source of energy. The present results were in agreement with those obtained by Markkar et al. (1984) and Abo-Donia et al. (2005) who attribute that to the similarity of energy sources and they also found that the digestibility coefficient of DM, CF, EE and NFE did not differ significantly between the control and other groups fed on diets contained a different percentage of SPT. Also, Louis et al. (1988) found that replacement of corn grains by SPT meal in fatting bulls did not significantly affect the digestibility of DM, CF and EE. The digestion coefficient of CP reduced gradually with increasing SPT levels of the ration. Digestion coefficient of CP was significantly (P<0.05) higher for T1, and T2 than that for T4. These results might be due to SPT protein being characterized by low degradability in the rumen (El-Sayed, 1991). Dominguez (1992) reported that the content of trypsin inhibitors in raw sweet potato tubers could decrease the protein digestibility in mixed feed.

As summarized in Table (3), the group that fed control and 33% SPT were (P<0.05) higher in apparent digestibility of NDF, ADF and cellulose compared with the group that fed 66 and 100% SPT. While no significant differences were observed among groups in the apparent digestibility of ADL and hemicellulose. The lower digestibility of NDF, ADF and cellulose in T2 and T3 than that T1 and T2 might be due to the fact that moisture of SPT affected the characteristics of rumen fermentation (Louis et al., 1988). They reported that starch digestibility was decreased with moisture sweet potato compared with heat treated sweet potato. ADL and hemicellulose were not affected by a higher level of SPT which could indicate that added SPT did not affect the microorganisms in the rumen. Starch digestibility and percent of moisture and kernel processing affect fiber digestibility (Blasel et al., 2006).

Feeding values as TDN were not significantly different between treatments. Abo-Donia et al. (2005) and Ruiz et al. (1995) found that no significant differences were detected between treatments for TDN with replacement SPT instead of YC as a source of energy. But the DCP was significantly (P<0.05) lower with an increasing level of SPT in the rations. These results are in good agreement with those reported by Abo-Dona et al. (2005) when fed the bulls ration containing 50, 75 and 100% SPT replacement of YC. Dominguez and Ly (1997) reported that the nutritive values of DCP gradually decreased with the increased level of SPT in the tested rations.

Table (3): Means ± SE of Nutrient digestibility, cell well constituent digestibility and nutritive values of different experimental rations.

Item	T1	T2	T3	T4	± SE
Nutrient digestibility					
DM	70.64	69.23	76.59	68.59	1.379
OM	72.11	70.76	69.28	70.17	1.421
CP	69.58 [a]	67.49 [a]	65.57 [ab]	62.91 [b]	1.145
CF	67.20	66.65	65.60	62.00	2.958
EE	79.28	79.21	72.39	73.79	2.979
NFE	66.76	67.31	68.25	69.59	0.768
Cell wall constituent's digestibility (%)					
NDF	76.76 [a]	66.26 [a]	65.66 [b]	64.23 [b]	0.323
ADF	63.78 [a]	62.51[a]	60.50 [b]	59.05 [b]	0.924
ADL	4.31	4.23	3.67	3.455	0.294
Cellulose	69.97 [a]	68.20 [a]	65.79 [b]	63.78 [b]	1.018
H-cellulose	81.07	80.10	84.75	84.74	2.267
Nutritive values (%)					
TDN	68.32	66.48	65.02	65.63	1.313
DCP	8.41 [a]	8.02 [ab]	7.67 [bc]	7.23 [c]	0.134

a, b and c Mean values with the same letter in the same row indicated significant differences (P<0.05).

Production of milk and milk solids content:

Production of milk, fat, protein, total solids, SNF and ash during the first 120 days of lactation are shown in Table (4). No significant differences were detected between treatments for total milk yield, fat, protein, total solids, SNF and lactose percent with replacement SPT instead of YC as a source of energy. Dominguez and Ly (1997) found that the replacement of corn with dehydrated sweet potato in the feed of dairy cows could give as much milk as corn alone.

FCM, SNF and lactose yield were increased significantly (P< 0.05) with T1 (100 % YC) compared with T4 (100 % SPT) group, but differences between T1, T2 and T3 groups were not significant. Abo-Donia et al. (2004) showed an increase of milk yield for dairy cows fed yellow corn plus berseem silage. Protein and TS yield were decreased significantly (P<0.05) with T3 and T4 compared to T1 group. The increase in fat, protein and lactose yield with T1 and T2 groups might be due to the increasing digestibility of CP, CF, and NFE (Table 3). Cronje et al. (1991), Nagel and Broderick (1992) and Salem (2003) reported that the increase in fat, protein and lactose content might be due to increasing digestion coefficients of CP, CF, NFE and increasing rumen activity and, in turns, stimulating high amount of TVFA's in the rumen.

Table (4): Means ± SE of milk yield and milk solids production during the first 120 d of lactation.

Item	T1	T2	T3	T4	± SE
Milk yield (kg/h/d)	16.58	16.32	15.29	15.24	0.487
FCM (kg/h/d)	15.59 [a]	16.27 [ab]	14.21 [ab]	14.10 [b]	0.332
Fat %	3.60	3.98	3.53	3.50	0.063
Fat yield	0.60 [a]	0.65[a]	0.54[ab]	0.53 [b]	0.012
Protein %	4.30	4.29	4.23	4.21	0.073
Protein Yield	0.71 [a]	0.70 [ab]	0.65 [b]	0.64 [b]	0.016
Total solid %	13.65	13.95	13.43	13.17	0.149
TS yield	2.26 [a]	2.28 [ab]	2.05 [b]	2.01 [b]	0.052
Solid not fat %	10.05	9.97	9.90	9.67	0.129
SNF yield	1.67 [a]	1.63 [ab]	1.51 [ab]	1.47 [b]	0.042
Lactose %	4.95	4.90	4.89	4.68	0.076
Lactose Yield	0.82 [a]	0.80 [ab]	0.75[ab]	0.71 [b]	0.024
Ash %	0.80	0.78	0.78	0.78	0.010
Ash yield	0.13	0.13	0.12	0.12	0.052
SCC	43.52	42.840	42.560	40.920	7.467

a, b and c Mean values with the same letter in the same row indicated significant differences (P<0.05).

Blood parameters:

Feeding SPT at different levels as replacement of YC had no significant effects on serum total protein (TP), albumin, globulin, A/G ratio, ALT and AST (Table 5). The present results are in agreement with those reported by Schneider et al. (1985), Manda et al. (1989) and Abo-Donia et al. (2005). This observation may be due to improving the utilization of both corn and potato starch in the small intestine with a decline in loss of energy as starch in feces (Schneinder et al., 1985, Broderick and Mairgan, 1997). Animals fed SPT had significantly (P<0.05) lower serum urea-N concentration than fed YC. The depression in serum urea in the group that received a ration containing SPT, may attribute to either low nitrogen concentration in the rumen or less nitrogen absorbed across the rumen wall as ammonia (El-Sayed 1991).

Table (5): Means ± SE of some blood parameters for cows fed a ration containing dried sweet potato.

Item	T1	T2	T3	T4	± SE
Total protein mg/dl	7.96	7.68	7.32	7.35	1.56
Albumin mg/dl	4.86	4.52	3.92	3.95	1.01
Globulin	3.10	3.16	3.4	3.4	1.00
A/G ratio	1.57	1.43	1.15	1.16	0.31
urea -N mg/dl	35.91[a]	33.14 [b]	33.09 [b]	32.90 [b]	3.52
ALT µ/ml	15.62	14.86	14.11	14.92	2.15
AST µ/ml	9.26	8.87	9.01	8.99	2.39

a, b and c Mean values with the same letter in the same row indicated significant differences (P<0.05).

Reproductive parameters:

The effects of treatments on some reproductive parameters are shown in Table (6) and Figure (1). No significant differences for days of the first estrus were observed among the different treatments. The intervals between calving to first behavioral estrous were 48.9, 46.26, 47.65 and 49.11 days in cows fed rations containing 100 % YC, 33 % SPT, 66 % SPT and 100 % SPT, respectively. The days from calving to the first insemination did not significantly differ among all groups of treated cows. The number of insemination per conception was not significantly affected by replacement SPT instead of YC as a source of energy.

Values of conception rate at the end of the treatment period were 90.50, 90.50, 88.66 and 88.33% for T1, T2, T3 and T4, respectively. The values of conception rate following the first postpartum AI were 66.26, 50.50, 56.33 and 66.33. Generally, cows among the treatments received three services for conception. These results are in agreement with other studies that have reported improved conception rates end delayed resumption of cyclicity when using sub-graded sweet potato tuber as a nontraditional source of energy instead of yellow corn in diets of dairy cows ration (Thibodean et al., 2002). Ibrahim et al. (2006) reported that using tops potato silage (TPS) and (TPS + corn) silage (as a source of energy) in the dairy cow rations improved the reproductive performance of cows as conception rate and the number of services per conception among treatments.

During the cycle, the plasma progesterone values of the cows fed a ration containing SPT instead of YC were lower, however, the differences between values were insignificant. The area under the progesterone curve (Figure 1), through the estrous cycle, was larger in cows fed a ration containing 100 %

YC and 33 % SPT than 66 % or 100 % SPT, with a difference of about 23 % larger, which indicated higher luteal activity in cows fed YC and 33 % SPT. The present data on plasma progesterone levels are in general agreement with those of Gombe and Hansel (1973) and Knutson, and Allrich (1988).

Ibrahim et al. (2006) found that the plasma progesterone levels of cows receiving rations containing (corn silage + STP silage) were significantly higher than cows fed rations containing CS or SPT silage.

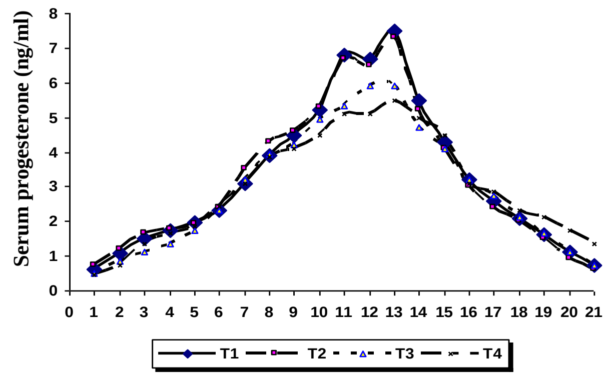

Fig. 1. Effect of treatments on progesterone profile.

Table (6): The effect of treatments on some reproductive parameters.

REPRODUCTIVE PARAMETER	T1	T2	T3	T4
Days of first estrus	48.90	46.26	47.65	49.11
Days of first AI	85.66	84.36	86.11	88.12
Number of services per conception	1.96	1.88	1.80	1.91
Conception rate %	90.50	90.50	88.66	88.33
Conception rate at 1st service	66.26	50.50	56.33	66.33
Conception rate at 2ed service	11.11	20.0	10.33	22.00
Conception rate at 3rd service	11.11	20.0	22.00	-

Feed intake, feed conversion and Economic efficiency:

Data in Table (7) show that the different levels of SPT as replacement for corn did not affect total DMI. These results could due to the nutritional quality of SPT which refers to the types and amounts of beneficial nutrients in the product (El-Sayed, 1991). Dominguez (1992) reported that SPT is rich in vitamin A.

As summarized in Table (7), DMI (Kg)/milk (Kg) was increased ($P<0.05$) significantly with a higher level of SPT (T4) compared with control ones, while values of TDN (Kg)/milk (Kg) were about the same for the different treatments. The results in Table (7) show that cost of Kg ration and the cost of Kg milk gradually decreased with the increased level of SPT rations. Feeding cost of producing Kg milk was reduced by 7.46, 11.94 and 22.39% for T2, T3 and T4, respectively, compared with the control one. Furthermore, total revenue was increased by 3.76, 6.02 and 11.28% with the replacement of SPT instead of corn grains by 33, 66 and 100 %, respectively.

Table (7): Means ± SE of Feed intake on DM basis, feed conversion and economic efficiency for cows fed a ration containing dried sweet potato.

Item	Treatments				± SE
	T1	T2	T3	T4	
Feed intake on DM basis (Kg):					
CFM	4.69	4.69	4.69	4.69	0.034
YC	4.02	2.68	1.34	0.00	0.012
SPT	0.00	1.34	2.68	4.02	0.022
BH	2.68	2.68	2.68	2.68	0.019
RS	2.01	2.01	2.01	2.01	0.010
TDMI	13.40	13.39	13.40	13.40	0.098
Feed conversion:					
DM kg/milk (Kg)	0.81 ^{b}	0.82 ^{ab}	0.88 ^{ab}	0.88 ^{b}	0.021
TDN kg/milk (Kg)	0.55	0.55	0.57	0.58	0.014
DCP g/milk (Kg)	67.97	65.80	67.22	63.57	1.73
Economic efficiency:					
Cost of feed intake	11.01	9.98	8.95	7.93	--
Cost of Kg ration	0.47	0.58	0.45	0.36	--
Price of Kg milk	2.0	2.0	2.0	2.0	--
Cost of Kg milk	0.67	0.62	0.59	0.52	--
Total revenue	1.33	1.38	1.41	1.48	--

a, b Mean values with the same letter in the same row indicated insignificant differences ($P<0.05$). Market price of 1 ton CFM= 1000 LE, CFM = 1000 LE, Y. Corn = 1100 LE, S. Pot = 150 LE, BH = 500 LE and RS = 100 LE

CONCLUSION

From this study, it is recommended for using sub-graded SPT as a source of energy and protein in dairy cow rations during the early lactation period instead of corn grain to improve the revenue of dairy cows. That is possible to feed dairy cows on rations containing 33% or 66% sub-graded SPT instead of corn especially during the harvesting season of sweet potato, without any serious adverse effect on milk yield and composition and reproductive performance of crossbred Friesian dairy cows.

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الاستجابة للإحلال الجزئي للذرة الصفراء بفرزه درنات البطاطا كمصدر غير تقليدي للطاقة على الاداء الانتاجي والتناسلي للأبقار الحلابة.

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مستخلص. أستخدم فى هذه الدراسة عشرون بقرة خليط فريزيان عمر ٤- ٥ سنوات فى بداية موسم الحليب الثاني والثالث. وكان متوسط وزنها ٥٢٠ كجم وقد قسمت الى أربع مجاميع تجريبية متزنة. وكانت المجموعات كالتالي: غذيت المجموعة الأولى على عليقة تحتوي على مخلوط العلف المركز، الذرة الصفراء، دريس البرسيم مع قش الأرز. بينما غذيت المجموعة الثانية والثالثة والرابعة على علائق حيث تم استبدال ٣٣، ٦٦، ١٠٠ % من الذرة الصفراء بفرزة درنات البطاطا على أساس المادة الجافة. وكانت أهم النتائج كالأتي: لم تلاحظ أي فروق معنوية بين المعاملات بالنسبة لمعاملات هضم المادة الجافة، المادة العضوية، الألياف الخام، مستخلص الأثير والمستخلص الخالي من الازوت.
بالنسبة للمجموعة التي غذيت على ٣٣ % من فرزة درنات البطاطا كانت مرتفعة فى معاملات الهضم الظاهري بالنسبة ل NDFو ADF والسيليلوز بالمقارنة بالمجموعات التى غذيت على ٦٦ ، ١٠٠ % . كما لوحظ إنخفاض نسبة البروتين الخام المهضوم فى العلائق مع زيادة نسبة الاستبدال بفرزة درنات البطاطا.
لم توجد اختلافات معنوية بالنسبة لإنتاج اللبن الكلى والنسبة المئوية لكل من الدهون والبروتين والجوامد الكلية واللاكتوز مع استبدال الذرة الصفراء بفرزة درنات البطاطا. و كذلك لم توجد اختلافات معنوية بالنسبة لمكونات الدم فى مستوى البروتين الكلي، الألبيومين، الجلوبيولين، النسبة بين الألبيومين و الجلوبيولين و ALT وAST .
زاد العائد الاقتصادي باستخدام فرزة درنات البطاطا على كل مستويات الإحلال بدلاً من الذرة الصفراء وكان أعلى عائد فى المجموعة التي غذيت على ١٠٠ % منها.
من نتائج هذه الدراسة يمكن التوصية باستخدام فرزة درنات البطاطا كمصدر للطاقة والبروتين فى علائق الأبقار الحلابة وخاصة فى المناطق الصحراوية التي يزيد محصول البطاطا فيها باستعمالها كمصدر للطاقة رخيص الثمن. كذلك التخلص من بقايا عروش ودرنات البطاطا غير الصالحة للاستهلاك الأدمي فى تغذية الحيوان وللحفاظ على بيئة نظيفة.