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PERFORMANCE OF GROWING BUFFALOS CALVES ON DIET CONTAINING CALCIUM SALTS OF FATTY ACIDS

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ABSTRACT

Twenty-one weaned four months old buffalo calves of about 90±1.232 Kg body weight were randomly allotted into three similar groups. The first group received a diet containing no supplemented fat, 2nd received diet containing local produced calcium salts of fatty acids (LCa-SFA) seeds and the3rd received a diet containing imported calcium salts of fatty acids (ImCa-SFA). A calcium salt of fatty acids (Ca-SFA) was added to concentrate diet by 8% on DM basis of total concentrate as replacement of 50% of corn grain on energy basis. The three rations were comparable in nutrient contents except that EE, which was lower in the treated rations. The content of ash, medium chain and saturated fatty acids were higher and the FA and AEE were lower in imported compared to the locate Ca-SFA. Feeding local Ca-SFA resulted in high ($P<0.05$) feed conversion and weight gain than the other two groups.

Nutrient digestibility and nutritive values, except AEE, were not affected with adding Ca-SFA to the experimental rations. The digestibilities of cell wall constituent (NDF, ADF, cellulose and hemi-cellulose) were not affected significantly by added Ca-SFA compared with control group.

The average daily gains of the tested groups were significantly higher than the control. Meanwhile, the group fed on ration included local Ca-SFA showed higher gain rate than those fed the imported Ca-SFA

Ruminal pH, TVFA's Acetate butyrate and A/P ratio, T N, NPN and TPN were not affected by feeding Ca-SFA as compared to the control group. A proportion of propionate was significantly ($P<0.05$) higher and NH_3-N was lower significantly with added Ca-SFA compared with control.

Total lipids, TG, total cholesterol and FFA's in blood serum were significantly higher in the treated groups compared to the control. Neither Local nor imported Ca-SFA affected the values of total protein, albumin, globulin, A/G ratio, NH_3-N, SGPT, and SGOT and alkaline phosphates in blood serum.

It could be concluded that local Ca-SFA instead of important one could be efficiently utilized in animal feeds as by pass fat for growing buffalo calves.

Keywords: Buffalo calves, calcium salts of fatty acids, growth, and digestibility.

INTRODUCTION

Many buffalo breeds in Egypt are facing an unpleasant problem with their young buffalo calves just after weaning. The calves in general show negative growth performance in term of low daily gain accompanied with hair roughness and scaly skin (El-Bedawy *et. al.* 1996 and Abo-Donia *et. al.* 2000). During suckling period the calf can be fed on an average of 4-liter milk per day. Buffalo milk is characterized by high fat content about of 7% (Khattab *et. al.* 1998). These amounts of milk supply the calves with about 280 gram of fat per day. After weaning calves are commonly raised on relatively low fat, ranging from 60 –70 g fat in concentrate diet (Czerkawski and Clapperton 1984), which cannot supply enough fat to animal as in buffalo milk. Noble (1978) summarized that, free fatty acids can function as readily available source of energy in the ruminants because of an extremely fast turnover rate combined with a rapid response to physiological metabolism and nutritional changes. The above mentioned negative growth responses and symptoms could be attributed to deficiency of fat or fat-soluble vitamin in the common used starter ration. Other reasons, increasing amount of carbohydrate in the calves diet compared to fat as source of energy leading to enteritis (Johnson and McClure 1972) and cause loss of energy as methane (Palmquist 1984). On the other hand, the fat decrease heat increment (Czerkawski and Clapperton 1984). Improving in growth rate has been noted with levels of fat supplementation as 3% (Hatch *et al.*, 1972); but depressions have been observed for levels greater than 5% of diet DM (Hentges *et. al.*, 1954; Hatch *et al.*, 1972).

Higher amount of cereal grains are required in the diets to increase digestible energy intake. The negative effects of excess starch feeding and the increased availability of feed-grade fats has led to renewed interest in using of fat to increase density of diets for ruminants (Palmquist and Jenkins, 1980). On the other hand, fat addition to ruminant rations has depressed fiber digestion in rumen (Palmquist and Jenkins, 1982). Such ruminal fermentation problems could be minimized, or even eliminated by feeding calcium salts of fatty acids (Jenkins, 1994).

A calcium salt of fatty acids is widely used at commercial level for meat and milk production in the developed countries. At the same time imported calcium salts of fatty acids considered as very expensive compared to that produced Local from by-product of Oil and Soap companies in Egypt (Abo-Donia *et. al.* 2003a,b and El-Bedawy *et. al.* 2003).

Feeding the already adapted calves to milk of high fat content for an extended period after weaning on high fat rations is the main objective of the present study as to investigate its effect as non traditional source of energy on growth performance and nutrients utilization of post-weaned buffalo calves. The 2nd aim of this study was to compare between imported Ca-SFA and Local Ca-SFA, which produced from by-products of Oil and Soap Co. on performance of growing buffalo calves after weaning.

MATERIALS AND METHODS

Twenty-one weaned four months old buffalo calves of about 90±1.232 Kg body weight were randomly allotted into three similar groups. Animals were adapted on the experimental rations two weeks before data collection. Initial body weight of the experimental animals is shown in Table (3). Animals were weighed every two weeks during 150-day experimental period.

Three concentrate feed mixtures (CFM) in pelleted form were formulated to be almost iso-caloric iso-nitrogenous. The first concentrate feed mixtures CFM-1 was not supplemented Ca-SFA and fed to control group. The 2nd concentrate feed mixtures CFM-2 was contained 8% local Ca-SFA on

DM basis instead of 50% of corn grain on energy basis. The 3rd concentrate feed mixtures CFM-3 was contained 8% imported Ca-SFA on DM basis instead of 50% of corn grain on energy basis. Concentrate feed mixture, berseem hay and rice straw were fed according to the biweekly body weight to cover the requirements according to (NRC 1984).

Animals were individually fed the concentrate twice a day at 08.00 and 4.00 and were allowed to drink at 10.00 and 5.30 p.m. Rice straw was offered at 09.00 and berseem hay offered at 1.00 one time. Chemical composition of feed ingredients and experimental rations are shown in Table (1). Chemical composition and profile of fatty acids of local and imported Ca-SFA are presented in Table (2).

Two sets of digestion trials were carried out at mid and end of the experimental period using three replicates applying the acid insoluble ash (AIA) technique suggested by (Van Keulen and Young 1977). Each nutrient digestibility represented an average of six values. During the digestion trial, animals were fed at 06.30am and 6.30pm and grab samples were collected at 06.00am and 6.00pm. Chemical composition of feeds and feces was determined according to A.O.A.C. (1990). Acidified ether extract (AEE) was determined by modified method as described Abo-Donia *et. al.* (2003b). 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 orderly. Gross energy value (GE) was determined for both feed and feces by using Gallen Kump ballistic bomb calorimeter (Catalog No. (CBB: 330-1010).

At the end of each digestibility trial rumen fluid samples were collected by using stomach tube. Ruminal liquor pH was immediately measured by using the HANNA pH-meter (model HI 8424). Total VFA's concentrations, molar proportions of VFA's, nitrogen fractions and ammonia-N were determined according to the methods described by Eadie *et al.* (1967), Erwin *et al.*, (1961), A.O.A.C., (1990), Conway, (1978), respectively. True protein nitrogen (True-PN) was estimated by the difference between TN and NPN.

Blood samples were withdrawn from (three animal in each group) the left jugular vein before morning meal at the end of feeding trials. Serum total lipids, triglycerides, cholesterol free fatty acids, total protein, albumin, NH_3-N, SGPT, and SGOT and alkaline phosphates were determined using commercial kits (Biomerieux 69280 Marcy-1, Etoile, France®). Serum globulin was obtained by subtracting the albumin value from the total protein concentration. A/G ratio was measured by dividing albumin value on its corresponding globulin value. Total fatty acids (long-chain) in blood serum were determined according to Itaya and Ui (1965).

Statistical analysis was carried out using SAS (1999). Duncan's Multiple Range Test (Duncan, 1955) was used to separate the means when the main effect was significant.

RESULTS AND DISCUSSION

Chemical composition of the experimental rations (Table 1) showed that the three rations were comparable in nutrient contents except that EE, which was lower in the treated rations. Although, EE was lower with added either source of Ca-SFA, the values of fatty acids (FA) and acidified ether extract (AEE) were higher. These results related to that Ca-SFA were not soluble in either water or alcohol but soluble in Hcl at pH value of 2 to 3 (80% of the soap was soluble), but insoluble at pH from 4 to 6 (El-Bedawy *et al* 2003). Sukhija and Palmquist (1990) found that Ca-SFA of palm fatty acids was stable at pH = 5.5, dissociation was recorded to be less than 10% at pH = 5.5, less than 5 at pH=6 and about 1% at pH=6.5

Table-1: - Chemical composition of different concentrates, used in the experimental tested, rations

Item	Concentrates feed mixtures			Experimental Rations		
	CFM-1	CFM-2	CFM-3	Control	LCa-SFA	ImCa-SFA
Chemical composition %						
DM	90.24	90.56	90.58	90.81	90.98	90.99
OM	90.16	88.05	87.66	87.89	86.81	86.61
CP	19.00	19.22	19.22	14.27	14.42	14.42
CF	6.78	8.40	8.40	21.65	22.38	22.38
Lipids						
EE	3.87	3.33	3.32	3.15	2.87	2.86
FA	3.16	8.88	8.76	2.55	5.58	5.52
AEE	4.13	10.27	9.86	3.72	6.98	6.76
NFE	60.52	57.10	56.72	48.82	47.14	46.93
Ash	9.84	11.95	12.34	12.11	13.19	13.39
Cell wall constituent %:						
NDF	19.67	21.52	21.52	36.32	37.17	37.17
ADF	14.55	16.65	16.65	27.74	28.75	28.75
ADL	1.50	1.55	1.55	3.54	3.55	3.55
Cellulose	13.05	15.09	15.09	24.20	25.19	25.19
H-cellulose	5.12	4.87	4.87	8.58	8.42	8.42
GE Mcal/kg	3.995	4.208	4.200	3.919	4.033	4.029

CFM-1 Concentrate feed mixture, composed of Soya bean meal (14%), yellow corn (41%), wheat bran (18%), molasses (4%), limestone (3%), Rice bran (4%), Lin seed cake (15%), Nacl2 (1%) and common salt (1%).

CFM-2 Concentrate feed mixture, composed of Soya bean meal (15%), yellow corn (20%), wheat bran (30%), molasses (4%), limestone (3%), Rice bran (4%), Local Ca-SFA (8%), Lin seed cake (15%), Nacl2 (1%) and common salt (1%).

CFM-3 Concentrate feed mixture, composed of Soya bean meal (15%), yellow corn (20%), wheat bran (30%), molasses (4%), limestone (3%), Rice bran (4%), Imported Ca-SFA (8%), Lin seed cake (15%), Nacl2 (1%) and common salt (1%).

NFE = OM – (CP + CF + AEE), FA = Total fatty acids and AEE= Acid ether extract

Data in Table (2) show that the imported Ca-SFA had a higher content of ash, medium chain fatty acids (C14:0-16:0) and saturated fatty acids, and lower content in FA and AEE as compared to local produced Ca-SFA. Local Ca-SFA processed form mixed soap stock of sunflower and soybean oil, which was highly content of unsaturated fatty acids. The advantage of raise unsaturated fatty acids in Local Ca-SFA compared with imported due to prevented deficiency symptoms of essential fatty acids, specially linolenic acid which, consider important for general tissue metabolism specially small animals in the ruminants (Noble 1978). Secondly, saturated fatty acids raise cholesterol in blood serum compared with unsaturated fatty acids (Wood *et. al.* 1993).

Concentrate feed mixture, roughage and total dry matter intake of the treated groups was comparable with the control group. The effect of added fat on DM intake is variable among studies (Johnson and McClure 1972, Sukhija and Palmquist 1990, El-Bedawy *et al* 1996, Abo-Donia *et al* 2000 and El-Bedawy *et al* 2003).

Table (2): Chemical composition of local and imported Ca-SFA in the experimental rations

Item	Local Ca-SFA	Imported Ca-SFA
Chemical composition (% on DM basis)		
DM	94.78	95.01
OM	78.22	73.35
Lipids:		
EE	4.11	3.57
AEE	78.22	73.35
TFA's	74.66	70.35
Other lipids	3.56	3.00
Ash	21.78	26.65
Gross energy Mcal/kg	7.402	7.291
Saponifacation		
Saponifable materials (AEE)	94.78	95.17
Unsaponifable materials (EE-Other lipids)	0.70	0.77
Nonsaponifable materials (Other lipids)	4.52	4.06
Fatty acids profile % of total		
$C_{14:0}$	6	22
$C_{16:0}$	11	37
$C_{16:1}$	4	6
$C_{18:0}$	8	33
$C_{18:1}$	37	1
$C_{18:2}$	24	1
$C_{18:3}$	10	0
Medium-chain ($C_{14:0-16:0}$)	21	65
Long-chain ($C_{17:0-18:3}$)	79	35
Saturated fatty acids	25	92
Unsaturated fatty acids	75	8
Saturated/unsaturated (%)	33	1150

NFE = [OM- (CP+CF+AEE)]

As presented in Table (3) Ca-SFA supplement increased the digestibility of acid ether extract (AEE). These results are in good agreement with those Abo-Donia *et. al.* 2003b and EL-Bedawy *et. al.* 2003).

Digestibilities of crude protein, crude fiber and nitrogen free extract had not affected by fat supplement (Table 6). The high EE digestibility of fat supplemented rations might be due to the high digestibility of added dietary fat (Palmquist and Conrad 1978, El-Bedawy *et al.*, 1994a,b and Khattab *et. al.* 2001). Palmquist (1984) reported that, calcium soap was solubilized significantly as fatty acids, which increase the solubility of the acid-soap complex in the bile salt. Ruminant animals absorb fats with a high degree of efficiency digestion or absorption coefficients ranged between 80% and 90% for a variety of fatty oils and fatty acids (Moore and Christie, 1984). This high efficiency was maintained even when the dietary intake of fatty acids was greatly increased. Crude fiber was not affected by added fat, which could indicate that added fat was protected and did not affect the cellulotic activity in the rumen. The digestibilities of cell wall constituent (NDF, ADF, cellulose and hemi-cellulose) were not affected significantly by added fat compared with control group. Although adding fat improved the energy values for the diets as TDN, SE and DE, the differences were not significant. The values of DCP did not significantly differed among the tested groups. El-Bedawy (1995) found that TDN value was improved by feeding Ca-SFA supplemented diets but DCP values were not improved.

Table (3): - Effect of feeding different sources of Ca-SFA on nutrient digestibility, cell wall constituent and nutritive values.

Item	Control	LCa-SFA	ImCa-SFA	*P<*
Nutrient digestibility %:				
DM	69.19±0.905	69.89±1.088	69.00±2.409	ns
OM	71.67±0.747	71.59±1.579	70.94±2.743	ns
CP	67.74±1.129	67.94±1.564	66.95±0.557	ns
CF	65.79±1.042	65.58±1.776	65.32±1.168	ns
AEE	77.63±0.705[b]	90.28±0.851[a]	89.80±0.446[a]	*
NFE	75.13±0.977	72.39±4.055	71.57±5.895	ns
DE	69.81±0.718	72.97±1.561	73.01±2.640	ns
Cell wall constituent %:				
NDF	50.09±1.814	50.06±2.551	50.00±1.840	ns
ADF	46.58±2.212	45.99±3.524	45.53±1.381	ns
Cellulose	61.51±1.230	63.95±3.864	64.49±4.351	ns
H-cellulose*	52.91±2.630	52.22±4.061	52.00±1.539	ns
Nutritive values%:				
TDN	66.49±0.681	69.50±1.485	69.54±2.515	ns
DE Mcal/kg	3.919±0.001	4.033±0.001	4.029±0.001	ns
DCP	9.49±0.159	10.20±0.859	10.54±0.665	ns
Nutritive ratio	7.00±0.048	6.94±0.755	6.69±0.691	ns

*** Hemi-cellulose**

a, b Means in the some row having different superscripts are significantly different at (p< 0.05).

ns = non-significant difference.

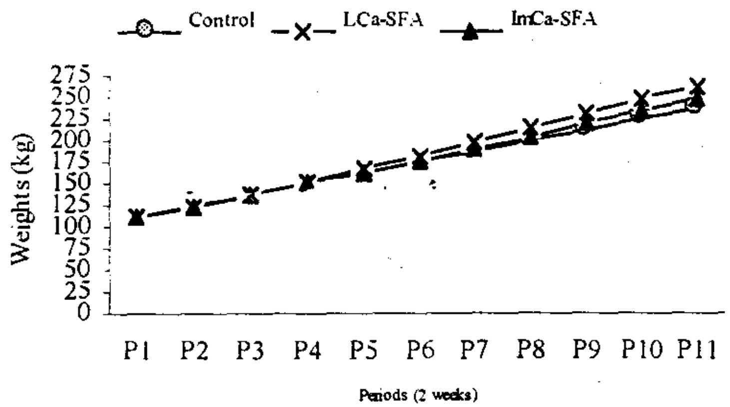

Fig. (1):- Effect of feeding Ca-SFA on changhing body weights

As presented in Table 4, the average daily gain of the tested groups were significantly higher than the control. Meanwhile, the group fed on ration included local Ca-SFA showed higher gain rate than those fed the imported Ca-SFA. This result could be due to that, the local one contained higher essential fatty acids especially ω3 (omega- 3) which improve healthy (Tinoco, 1982) and unsaturated fatty acids as shown in Table 2 compared to the imported material which improve gain of fattening animals (Johnson and McClure 1972 and Abo-Donia *et al* 2000). The development in body weight is illustrated in Figure 1. The difference among the experimental groups was not obvious before 5 periods, then the Local Ca-SFA group showed higher rate of body weight, followed by the imported Ca-SFA group. These results confirmed the findings of El-Bedawy *et al* 1996 and Abo-Donia *et al* 2000), which were carried out on growing buffalo calves fed fat.

Adding local Ca-SFA significantly ($P<0.05$) improved feed conversion ratio as kg DMI/kg gain as compared to control group. However, insignificant difference was revealed between the group fed local Ca-SFA and those fed imported one. Adding fat did not improved feed conversion ratio as energy units (kg TDN and DE Mcal/ kg gain) required to produce 1 Kg gain. White *et al.* (1992) found that feed efficiency of steers was not affected by fat supplement. Digestible protein conversion to gain was better in the Local fat supplemented group than the imported fat and unsupplemented one. It could refer to that dietary unsaturated fatty acids in local Ca-SFA could improve metabolism and save dietary protein this suggestion supported by (Wu *et al.*, 1991).

Table (4):- Effect of feeding different sources of Ca-SFA on performance of growing buffalo calves

Item	Control	LCa-SFA	ImCa-SFA	P<
Feed intake (kg/h/d)				
Concentrate	3.86±0.178	4.19±0.093	4.04±0.080	ns
Berseem hay	1.74±0.072	1.86±0.042	1.80±0.036	ns
Rice straw	1.74±0.072	1.86±0.042	1.80±0.036	ns
Total dray matter intake	7.35±0.316	7.92±0.178	7.64±0.150	ns
Roughage	3.49±0.143	3.73±0.083	3.59±0.070	ns
Con. / roughage ratio	1.11	1.12	1.13	
Average body weight (kg)				
Initial body weight	111.71±6.193	111.00±4.012	111.29±3.234	ns
Final body weight	236.86±8.162^{b}	261.69±4.684^{a}	248.02±4.197^{a}	*
Duration	150	150	150	
Total gain	125.14±2.021^{c}	150.69±2.487^{a}	136.74±2.581^{b}	*
ADG	0.834±0.013^{c}	1.005±0.017^{a}	0.912±0.017^{b}	*
Feed conversion				
Kg DMI/kg gain	8.78±0.234^{a}	7.89±0.183^{b}	8.39±0.177^{ab}	*
Kg TDN/kg gain	5.84±0.156	5.48±0.126	5.83±0.123	ns
Mcal DE/kg gain	24.03±0.644	23.22±0.534	24.67±0.520	ns
Kg DCP/kg gain	0.83±0.022^{ab}	0.80±0.018^{b}	0.88±0.019^{a}	*

$^{a, b}$ Means in the some row having different superscripts are significantly different at (P< 0.05).

C/R = Concentrate/roughage ratio   ns = non-significant difference.   * = (P<0.05)

As summarized in Table (5), adding the two different sources of Ca-SFA did not significantly affected pH and TVFA's in the rumen liquor compared with the control diet. Proportions of acetate and A/P ratio were not significantly (P<0.05) affected with added different sources of Ca-SFA compared with the control diet. Insignificant differences were found also between sources of fat. On the other hand, a proportion of propionate was significantly (P<0.05) higher with added fat, while no significant differences were found between sources of Ca-SFA. These results are in agreement with those found by Tamminiga, *et. al.* (1983), White *et al.* (1992) and EL-Bedawy *et al.*, (1994b and 1996) who indicated that fat increased propionate production and decreased methane production. Tamminiga, *et. al.* (1983), Czerkawski and Chappertion, (1984) and Jenkins (1994) stated that large amounts of lipids may cause a shift in the proportions of VFA towards propionate. This effect is more pronounced if unsaturated fatty acids are present in large amounts, but the effect occurs also with saturated fatty acids. The shift in VFA proportions is often coupled with a slight reduction in methane production. These changes may suggest increased ruminal energetic efficiency.

Adding Ca-SFA did not affect total nitrogen, non-protein nitrogen and true protein nitrogen (mg/100ml) in the rumen liquor as shown in Table 5. However, ammonia nitrogen was significantly lower with added fat and the values were significantly decreased with imported compared with Local Ca-SFA. These results could be attributed to increased free fatty acids in imported Ca-SFA by 10 %than that local one (see Table 2). Ohaguruka *et al.*, (1991) found that neither source nor amount of fat influenced efficiency of microbial protein synthesis.

Table (5): Effect of feeding different sources of Ca-SFA on some rumen parameters

Item	Control	LCa-SFA	ImCa-SFA	P<
pH	6.55±0.10	6.59±0.10	6.60±0.08	ns
TVFA's	11.57±0.31	11.36±0.42	11.54±0.42	ns
Molar proportions of fatty acids				
Acetate	61.35±0.03	61.79±0.07	61.84±0.09	ns
Propionate	22.18±0.05[b]	25.93±0.03[a]	25.09±0.04[a]	*
Butyrate	12.46±0.04	12.29±0.09	12.27±0.12	ns
A/P ratio	2.77±0.010	2.38±0.001	2.39±0.001	ns
Ruminal nitrogen				
Total nitrogen, mg/100 ml	123.99±6.43	124.67±6.14	126.75±6.36	ns
Non protein nitrogen, mg/100 ml	38.01±1.16	40.81±1.83	41.85±1.93	ns
Ammonia nitrogen, mg/100 ml	12.60±0.17[a]	11.53±0.16[b]	9.88±0.09[c]	*
True protein nitrogen, mg/100 ml	85.98±5.80	83.86±5.25	84.89±5.39	ns

MPN=Microbial protein nitrogen

[a, b] Means in the some row having different superscripts are significantly different at (P< 0.05).

ns = non-significant difference.

* = (P< 0.05)

Data in Table (6) show that the concentration of total lipids in blood serum was significantly increased with including either sources of Ca-SFA compared with the control group, while no significant difference was found between the two sources. Feeding the two-tested Ca-SFA resulted in increase (P<0.05) triglycerides (TG) and free fatty acids in blood serum compared with the control. Local Ca-SFA increased concentration of TG in blood serum compared with imported one. These results are supported with those reported by Steele (1980), El-Bedawy *et al.*, (1994b) and Abo-Donia, (2003). Higher physiological levels of blood parameters studied in this study were within the normal range for blood constituents of sheep (EL-Bedawy *et al.*1994b & 1996, Abo-Donia *et. al.* 2003a,b and Abo-Donia, 2003). Palmquist and Conrad (1978) attributed the high blood serum lipids of fat supplemented cows to the greater quantity of fatty acids absorbed from fat supplementations. In ours study Ca-SFA containing higher fatty acids (70.35 –74.66%, see Table 2). Total cholesterol in blood serum of calves was significantly increased with imported Ca-SFA compared with local one or control diet, while, no significant differences were found between Local Ca-SFA and control group. These results are related to the high content of saturated fatty acids in imported compared with Local Ca-SFA (Table 2). Wood *et. al.* (1993) and Abo-Donia (2003) reported that saturated fatty acids raise cholesterol in blood serum compared with unsaturated fatty acids. Neither local nor imported Ca-SFA affected the values of total protein, albumin, globulin, A/G ratio, NH_3-N, SGPT, and SGOT and alkaline phosphates in blood serum.

Table (6): Effect of feeding different sources of Ca-SFA on some blood parameters.

Item	Control	LCa-SFA	ImCa-SFA	*P*<
Total lipids (g/dl)	6.00±0.09[b]	6.70±0.06[a]	6.83±0.07[a]	*
Triethyilglysrol (mg/dl)	64.07±1.22[c]	102.67±1.48[a]	92.90±1.87[b]	*
Total cholesterol (mg/dl)	191.17±1.62[b]	195.40±4.78[b]	270.47±9.83[a]	*
Free fatty acids (meq/l)	16.33±0.47[c]	31.27±0.46[a]	27.97±1.27[b]	*
Total protein (g/dl)	6.22±0.14	6.26±0.02	6.25±0.11	ns
Albumin (g/dl)	3.02±0.04	2.91±0.06	2.94±0.04	ns
Globulin (g/dl)	3.21±0.16	3.36±0.07	3.31±0.15	ns
A/G ratio	0.95±0.06	0.87±0.03	0.89±0.05	ns
[illegible]N (mg/dl)	0.45±0.06	0.49±0.03	0.48±0.01	ns
SGPT. (IU/dl)	17.12 ±0.36	17.32±0.33	17.31±0.21	ns
SGOT. (IU/dl)	26.52±0.12	27.13±0.50	27.18±0.42	ns
Alkaline ph. (IU/L)	35.38±0.25	35.43±0.47	35.44±0.26	ns

a, b Means in the some row having different superscripts are significantly different at (p< 0.05).
ns = non-significant difference.
* = (P< 0.05)

The results in Table (7) show that price of kg gain of all rations were similar and the high cost of intake / kg gain with the ration containing Im Ca-SFA.

Table 7: - Economical evaluation for using different souses of Ca-SFA

Item	Control	LCa-SFA	ImCa-SFA
Feed Intake as fresh (kg/h/d)			
Concentrate feed mixture	4.278	4.630	4.463
Berseem hay	1.886	2.017	1.944
Rice straw	1.926	2.059	1.985
Total intake as fresh	8.090	8.706	8.392
Price of total intake (LE)	6.95	8.11	8.21
Price of kg ration (LE)	0.86	0.93	0.98
Price of kg TDN (LE)	1.29	1.34	1.41
Price of kg DCP (LE)	9.05	9.13	9.28
Price of kg Gain (LE)	13.50	13.50	13.50
Cost of intake / kg Gain	8.33	8.07	9.01
Total revenue (LE)	5.17	5.43	4.49

Soya bean meal = 2200 LE	Cost of CFM-1 =1250 LE/ ton
Wheat bran = 750 LE	Cost of CFM-2 =1380 LE/ ton
Yellow corn 1000 LE	Cost of CFM-3 =1470 LE/ ton
Molasses = 950 LE	Cost of Rice straw = 100 LE/ ton
Rice bran = 700 LE	Cost of BS-M = 200LE/ ton
Line seed cake = 1350 LE	
Lime stone = 95 LE	
NaCl2 = 120 LE	
Ca-SFA-Local = 2850 LE	
Ca-SFA-Imported = 3900 LE	

It could be concluded that local Ca-SFA instead of important one could be efficiently utilized in animal feeds as by pass fat for growing buffalo calves.

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أداء العجول الجاموسى النامية على غذاء يحتوى على دهن كالسيومى

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استخدم في هذه الدراسة إحدى وعشرون عجل جاموسي عمر أربع أشهر متوسط وزنها ٩٠±١,١٢٣ كجم. وزعت الحيوانات عشوائيا على ثلاث علائق حيث غذيت المجموعة الأولى على عليقه مقارنة تحتوى على علف مركز ودريس برسيم ولم يضاف لها دهون. المجموعة الثانية أضيف لها ٨٪ دهن كالسيومى محلى الصنع ويمثل ٥٠٪ من طاقة الذرة في العليقه المقارنة. المجموعة الثالثة أضيف لها ٨٪ دهن كالسيومي مستورد على نفس الاساس. العلائق كانت متزنة فى الطاقة والبروتين ومكوناتها الا ان مستخلص الأثير كان اقل من المتوقع في العلائق المختبرة في حين ارتفعت نسبة مستخلص الأثير الحامضى والأحماض الدهنية الكلية. وجد ان الرماد كان مرتفع في الدهن الكالسيومي المستورد كما وجد ان الأحماض الدهنية متوسطة السلسلة ك١٤ – ك١٦ والأحماض الدهنية المشبعة كانت مرتفعة في الدهن الكالسيومى المستورد مقارنة بالمحلى.

وجد ان متوسط الزيادة الوزنية اليومية فى المجاميع المختبرة كان اعلا من العليقة المقارنة وكانت المجموعة المغذاة على دهن كالسيومى أكثر تحسنا مقارنة بالمستورد. اضافة الدهن الكالسيومى المحلى الى علائق العجول الجاموسى حسن من معدل التحويل الغذائي (مادة جافة ماكولة/زيادة وزنية) فى حين لم يتاثر معدل التحويل الغذائى عند حسابه كمركبات غذائية مهضومة كلية او كطاقة مهضومة/ وحدة وزنية.

لم تتاثر درجة حموضة الكرش او الاحماض الدهنية الطيارة باضافة الدهن ولم تظهر اختلافات معنوية بين مصدرى الدهن الكالسيومى بالنسبة لحمض الخليك او النسبة بين حمض الخليك الى حمض البروبيونيك مع إضافة الدهن مقارنة بالمجموعة المقارنة. اضافة اى من مصدى الدهن لم تحدث تغير معنوى فى النتروجين الكلى بالكرش او المركبات الازوتية غير البروتينية او البروتين الحقيقى فى حين انخفضت الامونيا معنويا مع اضافى الدهون.

أدت إضافة مصدرى الدهن الى حدوث زيادة معنوية فى الدهن الكلى والجلسريدات الثلاثية والاحماض الدهنية الحرة لسيرم الحيوانات. زاد الكلسترول الكلى معنويا مع اضافة الدهن المستورد فى حين لم يحدث تغير معنوي بين الدهن المحلى والمجموعة المقارنة. بينت الدراسة ان تركيزات البروتين الكلى والالبيومين والجلوبيولين ونسبة الجلوبيولين للالبيومين والامونيا وإنزيمات وظائف الكبد فى سيرم الحيوانات المغذاة على دهون لم يتاثر مقارنة بالمجموعة المقارنة.

أوضحت نتائج الهضم وجود زيادة معنوية فى معاملات هضم مستخلص الأثير الحامضى فى حين لم تتاثر معاملات هضم باقى مكونات العليقة كذلك معاملات هضم مكونات جدر الخلايا. على الرغم من تحسن وحدات قياس الطاقة على صورة مركبات غذائية مهضومة كلية او طاقة مهضومة مع اضافة الدهن الا ان الاختلافات لم تكن معنوية مقارنة بالمجموعة المقارنة.

من نتائج هذة الدراسة يمكن ان نوصى بانة من الممكن تصنيع الدهن الكالسيومى محليا من مكونات ناتجة كمخلفات فى مصانع الزيوت والدهون لاتقل جودة عن المستورد كما انها تكون اقل فى قيمتها الاقتصادية. كذلك يمكن استخدام هذا المصدر من الدهن بكفاءة فى تغذية العجول الجاموسى فى الفترة مابعد الفطام.