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EFFECT OF FEEDING DIFFERENT LEVELS OF ORANGE WASTE SILAGE ON PRODUCTIVE PERFORMANCE OF LACTATING FRIESIAN COWS.

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ABSTRACT

Twenty lactating Friesian cows at the peak of lactation curve and in their first to third parity were used to study the effect of feeding diets containing different levels of orange waste silage on the nutrient digestibility coefficients and nutritive values of feeds, ruminal and some blood parameters and productive performance of Friesian cows .Friesian cows were chosen and divided into four similar groups (5 cows each) according to body weight, milk yield and number of lactations. Animals were fed on the following rations: First group was fed a control ration (R1) which consisted of 50% concentrate feed mixture (CFM), 45%, berseem hay (*Trifolium alexandrinum)* and 5% rice straw . Groups R2, R3 and R4 were fed the same formula of control with replacing 25, 35 and 45% of berseem hay by orange waste silage, respectively. Results indicated that cows fed R4 recorded significantly ($P<0.05$) higher digestibility coefficients of CP ,CF and EE than that of (R1) and showed higher DM and OM digestibility coefficients with no significant differences, while ration (R2) appeared to the highest ($P<0.05$) significant in CP digestibility, TDN recorded significantly ($P<0.05$) increased with increasing orange waste silage level, showing the highest TDN %with (R4) , while highest DCP%was found with (R2) . Cows fed R4 recorded the highest ruminal TVFA's concentration .While , NH_3-N concentration in rumen liquor decreased significantly with increasing level of orange waste silage in the rations. Concentration of total protein , albumin and globulin significantly ($P<0.05$) increased with R2 , while activities of GOT and GPT were significantly ($P<0.05$) lower with level 25% of orange waste silage .Cow fed R4 recorded significantly ($P<0.05$) the highest yield of actual milk and 4% FCM ,while those fed R3 recorded significantly ($P<0.05$) the highest of milk contents .Cow fed R4 showed the highest feed and economic efficiencies , while those fed the control ration had the lowest values. It could be concluded that, using orange waste silage as a source of roughage is more efficient especially during summer season under Egyptian conditions to replace berseem hay . Using 25% , 35% and 45% orange waste silage as a roughages replacement in the rations of lactating Friesian cows resulted in higher milk production and improve feed utilization and economic efficiencies, especially using 45% orange waste silage as a roughages replacement in the rations of lactating cows .

Keywords: Lactating Friesian cows , orange waste silage; digestibility , performance, milk yield and milk composition

INTRODUCTION

The increasing demand for animal protein foods requires integrated strategies to develop the livestock sector, feed supplies as a component of such strategies should consider the potentially using of new feed resources for ruminant. Additionally ,the overpopulation results in rise the demand of animal protein, so strategies should be directed toward exploring the possibility and the limit of using non-conventional sources as animal feeds.

Many million tons of agricultural waste are produced annually. Only few thousands of tons of crop residues are used for ruminant feeding. The remain of the crop residues are burned or wasted hence contributing to environmental pollution and subsequent health hazards. Due to its continuously increasing prices, attempts to use other new sources of roughages may be useful (Al-Shanti, 2003). In recent years and because of economic considerations and waste technology, the agro-industrial by-products are receiving much more attention by livestock producers and animal nutritionists Grasser *et al.* (1995). In winter, there are adequate quantity of berseem, which is considered as the main feed for farm animals in Egypt. Usually, it almost cover the requirements of animals in this period and the remainder quantities are dry preserved as hay for using in summer season (Etman *et al.,* 1994) In Egypt , many workers used agro-industrial wastes as animal feeds, such as banana waste Khattab *et al*. (2000a) and orange waste silage El-Nahas *et al.* (2004). Some problems such as containing of antinutritional compounds or presence of pathogenic microorganisms could be found in orange waste as an animal feed .One of several efficient extensive researches to solve such problems is ensiling process .

The objective of the present study was to investigate the possibilities of replacing different levels of berseem hay in dairy rations by orange waste silage and their effects on milk yield, feed and economic efficiencies using lactating Friesian cows.

MATERIALS AND METHODS

The present study was carried out at EL-Karada station belonging to Animal Production institute, Agricultural Research Center, Ministry of Agriculture.

Experimental animals and rations:

Twenty lactating Friesian cows were chosen at their peak of lactation with average body weight of 450±0.15 kg and their parity ranged from 1st to the 3rd, to investigate the effect of feeding different levels of orange waste silage instead of berseem hay on the productive performance of the cows. Friesian cows were divided into four similar groups (five animals in each) according to body weight, milk yield and number of lactations. Cows were fed one of the following rations: Cows in the first group were fed a control ration (R1) which consisted of 50% concentrate feed mixture (CFM)+ 45% berseem hay (Trifolium alexandrinum) + 5% rice straw. The second group was fed ration (R2) consisted of 50% CFM+ 20% berseem hay + 25% orange waste silage +5% rice straw . The third one was fed ration (R3) which consisted of 50% CFM+ 10% berseem hay + 35% orange waste silage + 5% rice straw. The fourth group was fed ration (R4) consisted of 50% CFM+ 45% orange waste silage +5% rice straw . orange waste was obtained from privet El-Marwa company, 6 October City. Silage of orange waste was made by using the feed toughs, as silos for ensiling processes, where 30 cm layer of rice straw was spread on the ground as bed to absorb the silage seepage and to prevent contamination with soil. The ensiled materials were

compressed by heavy drum filled with sand, then it covered with plastic sheet and pressed with 30 cm of soil layer and ensiled for more than 8 weeks. Cows were individually fed their experimental rations in order to cover their requirements according to NRC (2001) allowances for dairy cattle. The CFM was offered twice daily at 8 a.m. and 4 p.m. followed by berseem hay while orange waste silage and rice straw were offered once daily at 9 a.m. and 5 p.m., respectively. Also water was offered three times daily.

Digestibility trials:

Four digestibility trials were carried during the feeding trial for four days using three cows from each group to determine the nutrient digestibilities and nutritive value of the experimental rations by using acid insoluble ash (AIA) technique according to Van Keulen and Young (1977). Faces samples were daily collected from the rectum for four successive days from each animal. Chemical composition of the feed and feces samples were analyzed according to A.O.A.C. (1995).

Milk production:

Daily milk yield was recorded individually up to 150 days and modified to 4% fat corrected milk (FCM) using the formula of Gains (1928) as follows: 4% FCM = 0.4 × milk yield + 15 × fat yield (kg). Composite and representative samples of milk (morning and evening samples) were mixed by ratio of 1% weight of milk yield and analyzed biweekly for fat, lactose , protein , total solids , solids not fat and somatic cells counts using Milko-Scan (133B. Foss Electric).

Rumen liquor and blood samples:

Rumen liquor samples were taken at the middle of the trial at 0 time (before morning feeding) and 3 and 6 hours (after morning feeding) using stomach tube and then filtered through double layers of cheese cloth. Ruminal pH values were determined immediately using Orian 680 digital pH meter. Samples were stored in dry clean glass bottles with added 2 drops of mercuric chloride and kept in deep freezer for chemical analysis. Concentrations of ammonia-N and TVFA's were determined according to the method of A.O.A.C. (1995) and Warner (1964), respectively. Blood samples were taken from the jugular vein of each cow at the same 0 time (before morning feeding) of taking rumen liquor by clean sterile needle into clean dry heparinized glass tubes, thereafter they were centrifuged for 15 minutes at 4000 r.p.m. to obtain blood plasma. Plasma samples were analyzed for total protein and albumin while globulin was determined by the difference. Glutamate oxaloacetate transaminase (GOT), glutamate pyruvate transaminase (GPT) and blood urea were also determined using commercial diagnostic kits (Test combination, Pasteur lab.). Total protein was determined according to Weichselboum (1946). Albumin was determined colorimetrically according to Drupt (1974). Urea was determined according to Fawcett and Scott (1960)

Feed and economic efficiencies:

Feed efficiency was calculated as the amounts of DM, TDN, and DCP per kg 4% FCM. Economic efficiency of milk production was calculated as the ratio between the income of 4% FCM production and the cost of daily feed consumed, where the price of 1kg milk was 3 LE , which the prices of CFM ,

orange waste , rice straw and berseem hay were 1700 , 300, 250 and 800 L.E. , respectively according to year 2009 market price.

Statistical analyses:

The obtained data were statistically analyzed by general linear, model using ANOVA procedures of SAS (1985). The significant differences between treatments were tested using Duncan Multiple Range test (Duncan, 1955).

RESULTS AND DISCUSSION

Chemical composition of experimental rations and its ingredients:

Data of Table (1) showed that the orange waste silage was higher OM, EE and NFE contents than of berseem hay , while the later had higher in both CP and CF contents . Ash content of berseem hay was nearly double amount than that of orange waste silage. Calculated composition of the experimental rations showed that increasing level of orange waste silage lead to slightly decreasing in CP,CF and ash content . With slightly increasing in OM , EE and NFE contents.Generally , increasing orange waste silage level in tested ration appeared to slightly increased OM , EE and NFE contents, while CP and CF content slightly decreased . Similar results were obtained by (El-Nahas *et al.,* (2004) , Tage EL-Din *et al.,* (1983) and AL- Shanti (2003).

Table (1): Chemical analysis of the feedstuffs and calculated composition of the experimental rations (on DM% basis).

Item	%	Chemical composition on DM%					
	DM	OM	CP	CF	EE	NFE	Ash
*Concentrate feed mixture	91.75	91.00	16.59	12.06	2.80	59.55	9.00
Berseem hay	90.30	88.42	11.54	25.90	2.41	48.57	11.58
Rice straw	91.99	80.77	03.37	34.00	0.89	42.51	19.23
Orange waste silage	25.5	94.38	9.76	17.21	5.59	61.82	5.62
Experimental rations (calculated)							
R1: (control)	91.11	89.34	13.66	19.39	2.53	53.76	10.66
R2:	74.91	90.83	13.21	17.21	3.32	57.09	9.17
R3 :	68.51	91.04	12.63	16.75	3.57	58.09	8.96
R4 :	61.95	92.02	12.86	15.47	3.96	59.73	7.98

R1:50%CFM+ 45% berseem hay +5%rice straw

R2: 50%FCM+ 20%berseem hay + 25% orange waste silage + 5%rice straw .

R3 : 50%FCM+10%berseem hay + 35% orange waste silage +5%rice straw

R4 : 50%FCM+ 45% orange waste silage + 5 %rice straw

- **Concentrate feed mixture (FCM), consisted of 30% undecorticated cottonseed cake, 25% wheat bran, 22% yellow corn, 10% rice bran, 5% linseed cake, 5% Molasses, 2% limestone and 1% common salt**

Digestibility and nutritive values:

Nutrients digestion coefficients and nutritive values of the experimental rations fed to lactating Friesian cows are presented in Table (2).Ration containing 45% orange waste silage (R4) recorded significantly ($P<0.05$) higher digestibility coefficients of CP, CF and EE than that of (R1) and showed higher DM and OM digestibility coefficients with no significant differences . Ration containing 30% orange waste silage (R3) showed also higher digestibility coefficients for all nutrients than the control ration (R1) with

no significant differences, except for NFE digestibility which was somewhat lower value, as shown in Table (2). With respect to ration containing 25% orange waste silage (R2) , it could be noticed that all nutrient digestibility were higher than that of (R1) , recording significantly (P<0.05) differences with CP digestibility , while NFE digestibility was somewhat lower than that of (R1) with no significant differences .The nutritive value expressed as TDN significantly (P<0.05) increased with increasing orange waste silage level, showing the highest TDN recorded with R4 followed by R3, R2 and R1. At the some time , DCP % increased with rations containing orange waste silage , showing the highest DCP % was found with R2 (ration containing 25% orange waste silage). From data presented in Table (2) it could be show that increasing level of orange waste silage in rations formulation of lactating Friesian cows resulted in increasing of OM , CF and EE digestibility, while NFE digestibility showed slightly decreasing . Moreover , TDN as nutritive value apparent gradually increasing with increasing orange waste silage . while DCP% tended to decrease in R3 and R4 compared to R2. These results are in agreement with those obtained by (El-Nahas *et al*., (2004), Tage EL-Din *et al*., (1983) and AL- Shanti (2003). who found that the digestibility of DM, OM, EE and NFE and subsequently TDN value increased, While CP and CF digestibility and subsequently DCP value decreased with increasing level of vegetable marketing waste silage in the rations of lactating Friesian cows .

Table (2): Nutrients digestibility coefficient and nutritive values of the experimental rations.

Item	Experimental rations				SE ±
Digestion coefficients, %	**R1**	**R2**	**R3**	**R4**	
DM	64.32^{a}	64.89^{a}	64.85^{a}	66.12^{a}	0.533
OM	67.69^{a}	68.71^{a}	68.77^{a}	69.56^{a}	0.648
CP	57.66^{b}	65.92^{a}	65.55^{a}	65.33^{a}	0.441
CF	61.23^{b}	61.62^{b}	62.01^{b}	63.81^{a}	0.549
EE	67.37^{b}	67.82^{b}	72.32^{a}	71.53^{a}	0.537
NFE	72.57^{a}	71.59^{a}	71.21^{a}	71.93^{a}	0.437
Nutritive values, %					
TDN	62.25^{c}	64.83^{b}	65.75^{ab}	66.78^{a}	0.514
DCP	7.88^{b}	8.71^{a}	8.28^{b}	8.40^{a}b	0.108

a, b and c: means in the same row with different superscripts are significantly different (P<0.05)

Rumen liquor parameters

Rumen liquor parameters of lactating Friesian cows fed the experimental rations are presented in Table (3). It could be noticed that, ruminal pH value tended to significantly (P<0.05) higher value with R2,R3 and R4 than that of R1 during zero time , and with R2 and R3 during 3 hrs after feeding while it were significantly (P<0.05) lower with R2 and R3 during 6 hrs after feeding. So, feeding ration containing orange waste silage lead to higher pH value up to 3 hrs after feeding as shown in Table (3). However, NH_3-N Concentration during different times showed gradually decreased significant (P<0.05) with increasing levels of orange waste silage at 3 hrs

after feeding and were not significant at both 0 or 6 hrs after feeding. At the same time, concentration of TVFA's were higher values with increasing levels of orange waste silage during different times, showing significant (P<0.05) differences during 3 and 6 hrs after feeding , while the differences during zero time were not significant. Increasing of TVFA's with increasing levels of orange waste silage may be due to the significantly (P<0.05) highest energy value (TDN) for all experimental rations . These results agreed with those obtained by (El-Nahas *et al*., (2004) who found that TVFA's in rumen liquor increased significantly (P<0.05) with increasing levels of orange waste silage in all experimental rations. Tage EL-Din *et al*., (1983), Nour *et al*., (1981) and El-Nahas *et al*., (2004) found that ruminal NH_3-N concentrations decreased with increasing level of citrus pulp or orange –peel in rations.

Table (3): Rumen liquor parameters of lactating cows fed the experimental rations

Item	Experimental rations				SE ±
	R1	R2	R3	R4	
pH					
0	6.74^{b}	7.13^{a}	7.17^{a}	7.14^{a}	0.051
3	6.23^{b}	6.80^{a}	6.6^{a}	6.13^{b}	0.075
6	6.44^{a}	6.36^{a}	6.33^{a}	5.83^{b}	0.107
NH_3-N (mg/100ml)					
0	17.43^{a}	17.07^{a}	16.87^{a}	15.84^{a}	0.595
3	23.87^{a}	23.27^{ab}	22.98^{ab}	21.54^{b}	0.523
6	16.63^{a}	15.87^{a}	15.10^{a}	14.10^{a}	1.057
TVFA's (meq/100ml)					
0	10.03^{a}	11.03^{a}	11.83^{a}	12.23^{a}	0.865
3	15.84^{c}	16.84^{bc}	17.63^{ab}	18.70^{a}	0.522
6	8.28^{d}	9.28^{bc}	10.28^{b}	11.30^{a}	0.245

a, b and c: means in the same row with different superscripts are significantly different (P<0.05)

Blood plasma constituents:

Blood plasma constituents of lactating Friesian cows fed the experimental rations are shown in Table (4)**.** Data showed that , total protein and albumin in blood plasma of animals fed R2 (containing 25% orange waste silage) was significant (P<0.05) higher than that of recorded with R1 . Globulin concentration with R2 recorded somewhat higher value with no significant differences .Increasing level of orange waste silage in ration (R4) was not significantly affected on total protein and albumin concentration .Generally, concentration of total protein , albumin and globulin showed lower value with increasing level of orange waste silage in ration formulation of lactating Friesian cows. These results were associated with level of DCP in the experimental rations (table2) and CP content (Table 1). These results are in agreement with those obtained by Mahmoud and Mihalka (1978).who reported that plasma proteins concentrations increased with increasing the contents of CP and DCP of the ration. Also, El-Nahas *et al*., (2004) found that concentration of total protein , albumin and globulin significantly (P<0.05) increased with lowest level of orange waste silage of lactating Friesian cows.

Activity of transaminases (GOT) showed significantly (P<0.05) increased with increasing the level of orange waste silage with rate of 45%(R4), while GPT was decreased with no significant differences as shown in table (4). Blood parameters were within the normal levels of farm animals as indicate by Kaneko (1989) which means that the hepatic and nephritic functions associated with energy and protein metabolism seem to be not affected by feeding orange waste silage , indicating normal liver function of feeding lactating cows on orange waste silage . Blood urea significantly (P<0.05) increased with increasing levels of orange waste silage up to 45% in R4. So, the urea concentration in blood plasma showed higher value with increasing level of orange waste silage in ration. The same trend was observed with total VFA's concentration in rumen liquar which opposite trend was recorded with NH_3-N concentration. The present results are in close agreement with those obtained by El-Nahas *et al.,* (2004) who found that concentration of total protein , albumin and globulin significantly (P<0.05) increased with decreased level of orange waste silage of lactating Friesian cows.

Table (4): Blood plasma constituents of lactating Friesian cows fed the experimental rations.

Item	Experimental rations				SE ±
	R1	R2	R3	R4	
Total protein (g/100dl)	7.31^{c}	7.96^{a}	7.37^{b}	7.13^{c}	0.067
Albumin(g/100dl)	4.13^{b}	4.80^{a}	4.26^{b}	4.20^{b}	0.077
Globulin(g/100dl)	3.00^{a}	3.15^{a}	3.00^{a}	2.93^{a}	0.087
Urea(mg/100dl)	24.78^{c}	27.33^{ab}	27.15^{b}	29.03^{a}	0.536
GOT(IU/ L)	26.00^{b}	22.33^{c}	26.33^{b}	29.33^{a}	0.577
GPT(IU/L)	16.00^{ab}	13.00^{c}	17.67^{a}	14.33^{bc}	0.553

a, b and c: means in the same row with different superscripts are significantly different (P<0.05)

Milk yield and its composition:

Average daily milk yield and milk composition of lactating Friesian cows fed the experimental rations are presented in Table (5). The significant highest actual and 4% FCM yield were recorded with R4,being 13.53 and 12.94 kg , respectively, versus 11.32 and 10.25 kg with cows fed R1. From data presented in Table (5) it could be noticed that increasing level of orange waste silage instead of berseem hay tended to significantly (P<0.05) increase of fat, protein , total solid and solid not fat percentage compared to control ration.Generally, using orange waste silage in ration formulation of lactating Friesian cows exposed to increase milk yield and its composition . These results are within the values obtained by KHattab *et al*., (2000) and Al-Shanti (2003) who found that cows fed agro-industrial by-products or orange waste silage showed higher milk yield, 4% FCM yield and milk composition. El-Nahas *et al*., (2004) found that The significant highest actual, 4% FCM yield, fat, protein, total solids and solids not fat were recorded with increasing levels of orange waste silage of lactating Friesian cows. Coulon, *et al*., (1997) found that dairy cows fed grass silage yielded more milk than those fed hay .

Table (5): Daily milk yield and milk composition of cows fed the experimental rations.

Item	Experimental rations				SE ±
	R1	R2	R3	R4	
Actual milk (kg/day)	11.32^{b}	12.20^{ab}	12.22^{ab}	13.53^{a}	0.584
4% FCM(kg/day)	10.25^{b}	11.52^{ab}	11.85^{ab}	12.94^{a}	0.623
Milk composition (%)					
Fat	3.37^{c}	3.63^{b}	3.80^{a}	3.70^{b}	0.114
Protein	3.10^{c}	3.22^{b}	3.29^{a}	3.25^{b}	0.053
Total solids (TS)	10.27^{c}	10.76^{b}	11.19^{a}	11.15^{a}	0.339
Solids non fat (SNF)	6.90^{c}	7.13^{b}	7.39^{a}	7.45^{a}	0.228

a, b and c: means in the same row with different superscripts are significantly different (P<0.05)

Feed intake and feed efficiency:

Feed efficiency of lactating Friesian cows fed the experimental rations are shown in Table (6). Cows fed R4 (containing 45% orange waste silage) showed significantly (P<0.05) the highest feed utilization efficiency followed by those fed R3 (containing 35% orange waste silage) , while those fed the control ration showed the lowest feed utilization efficiency . This was might be attributed to cows fed R4 recorded the lowest amounts of DM intake per 4% FCM , while those fed the control ration had the highest DM amounts. Feed utilization efficiency expressed as kg 4% FCM/kg DM, TDN or DCP intake showed significantly (P<0.05) improvement with animal fed ration R4 (containing the highest level from orange waste silage), being 0.813, 1.217 and 9.657 kg 4% FCM per kg DM, TDN and DCP intake, respectively.

Table 6: Average daily feed intake and feed efficiency of lactating Friesian cows fed the experimental rations.

Item	Experimental rations				SE ±
	R1	R2	R3	R4	
Daily feed intake(as fed)(kg/head):					
Concentrate feed mixture (CFM)	8.49	8.59	8.59	8.68	
Berseem hay	7.76	3.49	1.75	-	
Rice straw	0.85	0.86	0.86	0.87	
Orange waste silage	-	15.45	21.61	28.08	
Daily DM intake(as DM))(kg/head):					
CFM	7.79	7.88	7.88	7.96	
Berseem hay	7.01	3.15	1.58	-	
Rice straw	0.78	0.79	0.79	0.80	
Orange waste silage	-	3.94	5.51	7.16	
Total feed intake (kg/head):					
DM	15.58	15.11	15.08	15.07	
TDN	9.70	9.80	9.92	10.06	
DCP	1.23	1.32	1.25	1.27	
Daily 4% FCM (kg)	10.25^{b}	11.52^{ab}	11.85^{ab}	12.94^{a}	0.623
Feed efficiency:					
4%FCM/kg DM intake	0.658^{b}	0.731^{ab}	0.752^{ab}	0.813^{a}	0.042
4%FCM/ kg TDN intake	1.057^{b}	1.127^{ab}	1.144^{ab}	1.217^{a}	0.058
4%FCM/kg DCP intake	8.333^{b}	8.409^{ab}	9.115^{ab}	9.657^{a}	0.449

a, b and c: means in the same row with different superscripts are significantly different (P<0.05)

Moreover, animals fed rations including orange waste silage appeared to more efficient for feed utilization efficiency that those fed control ration. The previous results are in accordance with those obtained by El-Nahas *et al*., (2004) who found that Cows fed ration (contained 50% orange waste silage) showed significantly (P<0.05) the highest feed utilization followed by those fed ration containing 25% orange waste silage of lactating Friesian cows. Mahmoud *et al*., (1992) noticed that the efficiency of energy and protein utilization was higher for dairy cows fed corn silage compared with those fed the control ration. Bendary *et al.,* (2000) stated that feeding sugar beet tops silage for dairy cows led to increased feed efficiency . They found that protein and energy utilizations of lactating cows fed vegetable marketing waste silage were higher than those fed control ration.

Economic efficiency:

Economical efficiency of lactating Friesian cows fed the experimental rations are shown in Table (7). Data revealed that animals fed different rations containing orange waste silage (tested rations) showed more efficient to get more milk yield, subsequently , tested rations giving more economical efficiency . It. Could be noticed that the feed cost per kg milk yield recorded 1.84, 1.82, 1.86 and 1.73 L.E. with rations R1,R2,R3 and R4, respectively, showing the highest economical efficiency with ration R4 (1.73 LE), as shown in table (7). So, increasing levels of orange waste silage in ration formulation of lactating Friesian cows lead to more of economical efficiency. These results are in agreement with those obtained by El-Nahas *et al*., (2004) who showed significantly (P<0.05) the highest feed conversion and economic efficiency for cows fed the ration containing 50% orange waste silage. Kholif and Abo EL-Nor (1998) found that using industrial by –products in goat ration reduced feeding cost.

Table (7): Economic efficiency of lactating Friesian cows fed the experimental rations.

Item	Experimental rations			
	R1	R2	R3	R4
Daily feed intake(as fed)(kg/head):				
Concentrate feed mixture	8.49	8.59	8.59	8.68
Berseem hay	7.76	3.49	1.75	0.0
Rice straw	0.85	0.86	0.86	0.87
Orange waste silage	0.0	15.45	21.61	28.08
Economic efficiency:				
Actual milk (kg/h)	11.32	12.20	12.22	13.53
Daily feed cost (LE)	20.85	22.25	22.70	23.40
Feed cost/ kg milk (LE)	1.84	1.82	1.86	1.73
*Price of daily milk yield (L.E.)	33.96	36.60	36.66	40.59
Economical return (LE)	13.11	14.35	13.96	17.19
Economic efficiency	1.63	1.64	1.61	1.73

a, b and c: means in the same row with different superscripts are significantly different (P<0.05)

*** Price 1kg milk was 3 LE , 1 ton CFM was 1700 LE, 1ton orange waste was 300LE, 1 ton RS was 250 LE and for 1 ton berseem hay was 800LE according to year 2009 market price.**

ALShanti (2003) reported that feeding orange waste silage led to decrease feed cost and increased income of 4% FCM and subsequently led to higher economic efficiency than the control group.

Conclusion:

It could be concluded that, using orange waste silage as a source of roughage is more efficient especially during summer season under Egyptian conditions to replace berseem hay. Using 25%, 35% and 45% orange waste silage as a roughages replacement in the rations of lactating cows resulted in higher milk production and higher feed utilization and economic efficiency , especially using 45% orange waste silage as a roughages replacement in the rations of lactating cows .

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تأثير التغذية على مستويات مختلفة من سيلاج قشر البرتقال على الاداء الانتاجى للابقار الفريزيان الحلابة

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أجريت هذة الدراسة على 20 بقرة فريزيان حلابة ما بين الموسم الاول و الثالث ، متوسط أوزانها 450 ± 15كج وزعت عشوائيا الى أربعة مجاميع متماثلة (كل مجموعة تحتوى على 5 حيوانات) . غذيت أبقار المجموعة الاولى على عليقة المقارنة (1) :50% علف مركز+ 45% دريس برسيم+ 5 % قش ارز ، بينما غذيت أبقار المجاميع المختبرة (الثانية و الثالثة و الرابعة) على نفس عليقة المقارنة مع استبدال دريس البرسيم بمستويات مختلفة من سيلاج قشر البرتقال (25% للمجموعة الثانية) و (35% للمجموعة الثالثة) و (45% للمجموعة الرابعة)

و قد أوضحت النتائج ما يلى:

1- اظهرت الابقار المغذاه على العليقه الرابعة أعلى معاملات هضم للمادة الجافة و المادة العضوية مع عدم وجود فروق معنوية و الالياف الخام و المستخلص الخالى من الازوت بقيم عالية عند مستوى معنوية 5% وتبع ذلك مجموع المركبات الغذائية المهضومة يليها الابقار المغذاة على العليقة الثالثة ثم الثانية بالمقارنة لعليقة المقارنة .

2- اظهرت الابقار المغذاة على العليقة الرابعة اعلى تركيز للاحماض الدهنيةالكلية الطيارة كما أنخفض تركيز نيتروجين الامونيا معنويا فى سائل الكرش مع زيادة مستوى سيلاج البرتقال فى العليقة مع عدم ظهور تاثيرات عكسية على نسب البروتين والالبيومين واليوريا وكذلك نشاط انزيمات الكبد عند استخدام سيلاج قشر البرتقال بالنسب المختلفة .

3- اظهرت أبقار المجموعة الرابعة معنويا(على مستوى 0.05) اعلى انتاج فعلى للبن(13.53 كجم) و اللبن المعدل 4% (12.94 كجم) اما بخصوص مكونات اللبن وهى الدهن والبروتين و الجوامد الصلبة فانها زادت عند التغذية على مستوى 35% سيلاج قشر برتقال فى العليقة الثالثة تليها المجموعة الرابعة والتى تحتوى على مستوى 45% سيلاج قشر البرتقال

4- سجلت أبقار المجموعة الرابعة أعلى كفاءة غذائية (0.813 ، 1.217 ، 9.657 .كجم لبن معدل الدهن لكل كجم ماكول من المادة الجافة ، المركبات الكلية المهضومة والبروتين المهضوم على التوالى) و كذلك اعلى كفاءة اقتصادية مقارنة بالمجموعات الاخرى.

من هذه الدراسة نستخلص انة يمكن استخدام سيلاج قشر البرتقال خلال فصل الصيف بدلا من دريس البرسيم حيث ان استخدام سيلاج قشر البرتقال بنسب 25% ، 35% ، 45% كمادة مالئة فى علائق الابقار الحلابة حقق اعلى انتاج من اللبن واعلى كفاءة غذائية واقتصادية وخاصة عند احلال سيلاج قشر البر تقال بنسبة 45% فى العليقة محل دريس البرسيم فى علائق الابقار الحلابة حيث اعطت اعلى انتاج من اللبن واعلى كفاءة غذائية واقتصادية مقارنة بالنسب الاخرى.

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