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EFFECT OF FEEDING BERSEEM AND ORANGE WASTE SILAGES ON PRODUCTIVE PERFORMANCE OF LACTATING FRIESIAN COWS

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ABSTRACT

Twelf lactating Friesian cows at 6 weeks of lactation period with an average body weight of 450 ± 0.17 kg, in the 2nd to the 4th lactation were used in complete switch-back design and divided randomly into four similar groups according to body weight, milk yield and number of lactations (3 cows in each). Cows in the first group were fed a control ration (R1) that consisted of 60% concentrate feed mixture (CFM), 15% rice straw (RS) and 25% berseem hay (BH). The other three groups were fed rations which consisted of 50% CFM, 15% RS and 35% from both berseem silage (BS) and orange waste silage (OWS) at different ratios, 75:25 for the second group (R2), 50:50 for the third group (R3) and 25:75 for the forth group (R4). Contents of CP, CF and ash were lower, while EE and NFE contents were higher in OWS compared with BS. Contents of CP, CF and ash increased, while OM, EE and NFE contents decreased with increasing level of BS and decreasing level of OWS in the rations. Cows fed R3 recorded significantly ($P<0.05$) the highest digestibility coefficients of DM, OM, CF, EE and NFE and subsequently TDN and ME values. While, cows fed R2 had significantly ($P<0.05$) the highest digestibility coefficient of CP and subsequently DCP value. Cows fed R1 showed the highest intake of CFM, RS, DM, TDN, ME and CP compared with the other silage groups. While, cows fed R2 had significantly ($P<0.05$) the highest intake of DCP.

Ruminal pH values were nearly similar for different experimental groups. Cows fed R3 recorded the highest ruminal TVFA's concentration ($P<0.05$). While, NH_3-N concentration in rumen liquor inecreased significantly ($P<0.05$) with increasing level of BS and decreasing level of OWS in the rations. Concentrations of total protein, albumin, globulin and creatinine significantly ($P<0.05$) increased, while activities of GOT and GPT significantly ($P<0.05$) decreased with increasing level of BS and decreasing level of OWS in the rations. Cows fed R3 recorded significantly ($P<0.05$) the highest yield of actual milk, 4% FCM and milk contents followed by cows fed R2. Cows fed the control ration recorded significantly ($P<0.05$) the highest fat and lactose contents in milk and those fed R3 had the highest total solids content ($P<0.05$). While, there were no significant differences in protein, solids not fat and ash contents among the experimental groups. Cows fed R3 showed the highest feed and economic efficiencies, while those fed the control ration had the lowest values ($P<0.05$).

Keywords: Lactating Friesian cows, berseem and orange waste silages, digestibility, milk yield and 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 towards 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 soures of roughages may be useful (Al-Shanti, 2003).

In winter, there are adequate quantity of berseem, which is considered as the main feed for farm animals in Egypt. Usually, it almost covers the requirements of animals in this period and the remainder quantities are dry prserved as hay for using in summer season (Etman *et al.*, 1987). Ensiling is an excellent means of preserving high moisture crops (berseem) during periods when drying is not feasible or for crops which would deteriorate in quality if allowed to dry (Church, 1991). In Egypt, many workers used Agro-industrial wastes as animal feeds, such as banana waste (Khattab *et al.*, 2000b), olive pulp and date seeds (Kholif and Abo El-Nor, 1998; Kholif *et al.*, 2001 and Youssef *et al.*, 2001) and Orange waste (Khattab *et al.*, 2000a). 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 using of berseem and orange waste silages in feeding of lactating Friesian cows and their effects on milk yield, feed and economic efficiencies.

MATERIALS AND METHODS

The present study was carried out at Karada Animal Production Research Station, Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture.

Experimental animals and rations:

Twelf lactating Friesian cows at 6 weeks of lactation period with an average body weight of 450 $\pm$ 0.17 kg and between the 2nd to the 4th lactations were used in complete switch-back design for three feeding periods. Each period consisted of 28 days, the first 14 days of each period were considered as transition period followed by 14 days test period as described by Lucas (1956). Cows were divided randomly into four similar groups according to body weight, milk yield and number of lactation (3 cows in each). In the first group, cows were fed a control ration (R1) that consisted of 60% concentrate feed mixture (CFM), 15% rice straw (RS) and 25% berseem hay (BH). The other three groups were fed rations consisted of 50% CFM, 15% RS and 35% from both berseem silage (BS) and orange waste silage (OWS) at different ratios, 75:25 for the second group (R2), 50:50 for the third group (R3) or 25:75 for the forth group (R4). Orange waste was obtained from Johina Company, 6 October city. Berseem and orange waste silages were made between feed toughs, where 30 cm layer of rice straw spread on the ground as bed to absorb the silage seepage and to prevent

contamination with earth. Ground corn grain was added at level of 1% for berseem silage only to increase the activity of silage fermentation. The ensiled materials were compressed by heavy drum filled with sand, then covered with plastic sheet and were hard pressed with 30 cm of soil layer and ensiled for eight weeks.

Concentrate feed mixture was 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. Concentrate feed mixture was obtained from El-Salam Feeds Factory, El-Marg, Cattle Assurance Box, Ministry of Agriculture, Egypt. Molasses from Sugar Company, El-Hawamdia, Egypt. While, fresh berseem, berseem hay and rice straw were brought from the local area, Kafr El-Sheikh, Egypt. Cows were individually fed the experimental rations to cover the requirements of lactating cows according to NRC (1988) allowances for dairy cattle. Concentrate feed mixture was offered twice daily at 8 a.m. and 4 p.m. and berseem hay or berseem and orange waste silages were offered once daily at 9 a.m., while rice straw was offered once daily at 5 p.m. Water was offered three tims daily at 7 and 12 a.m. and 6 p.m.

Digestibility trails:

Four digestibility trails were conducted during the feeding period to determined nutrients digestion coefficients and nutritive values of the experimental rations using acid insoluble ash (AIA) as a natural marker (VanKeulen and Young, 1977). Each digestibility trail consisted of 15 days as a preliminary period followed by 7 days collection period. Samples of CFM, BH, BS, OWS and RS were taken at the beginning, middle and end of the digestibility trails for chemical analysis. Feces samples were taken from the rectum of each cow twice daily at 12 hours apart during the collection period. The samples were composted, dried in a forced air oven at 65 ^{0}C for 48 hours and ground. Representative samples of feedstuffs and feces were chemically analyzed according to A.O.A.C. (1990). Nutrients digestion coefficients were calculated from the equations stated by Schnider and Flatt (1975).

DM digestibility (%) =100 – [100X (AIA% in feed / AIA% in feces)]

Nutrient digestibility (%) = 100 – [100X (AIA% in feed / AIA% in feces) (nutrient % in feces / nutrient % in feed)]

Milk production:

Daily milk yield was recorded individually and corrected for 4% fat content (FCM) using the formula of Gains (1928) as follows:

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

Milk samples from consecutive evening and morning milking were taken at 4th weeks of each feeding period. The percentages of fat, protein, lactose and total solids in milk of cows of different groups were determined using Milko-Scan (133B. Foss Electric). Milk fat and protein reanalyzed by Garber's and macrokjeldahle methods as described by Ling (1963) and average percentages of fat and protein in each milk samle were recorded.

Rumen liquor:

Rumen liquor samples were taken at 4th weeks of each period after 3 hours from the morning feeding using stomach tube and filtered through double layers of cheese cloth. Ruminal pH value was determined immediately using Orian 680 digital pH meter. Concentrations of ammonia-N and TVFA's were determined according to the method of A.O.A.C. (1990) and Warner (1964), respectively. Blood samples were taken from the jugular vein of each cow at the same time of rumen liquor sampling by clean sterile needle into clean dry heparinized glass tubes, thereafter were centrifuged for 15 minutes at 4000 r.p.m. to obtain blood plasma. Plasma samples were analyzed for total protein, albumin, globulin (by the difference), creatinine, GOT and GPT using commercial diagnostic kits (Test Combination, Pasteur Lab.).

Feed conversion and economic efficiency:

Feed efficiency was calculated as the amounts of DM, TDN, CP 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 average daily feed consumed as follows:

Economic efficiency = Income of daily 4% FCM yield / Cost of daily feed intake.

Where the price of 1 ton was 1500 LE for 4% FCM, 1200 LE for CFM, 650 LE for BH, 90 LE for BS, 50 L.E. for OWS and 60 L.E. for RS according to year 2004 market price.

Statistical analysis:

The data were subjected to statistical analysis as a complet swich-back design according to Lucas (1956). Significance was determined by multiple range test according to Duncan (1955).

RESULTS AND DISCUSSION

Chemical composition:

Chemical composition of all used tested feedstuffs and calculated composition of experimental rations are presented in Table (1). Contents of CP, CF and ash were lower, while EE and NFE contents were higher in OWS compared with BS. Calculated composition of the experimental rations showed that CP, CF and ash contents slightly decreased, while OM, EE and NFE contents slightly increased with increasing level of OWS and decreasing level of BS in the rations. Similar results were obtained by Tag El-Din *et al.* (1982) and Al-Shanti (2003).

Digestibility and nutritive values:

Nutrients digestibility coefficients and nutritive values of the experimental rations fed to lactating Friesian cows are presented in Table (2). Cows fed R2 and R3 recorded significantly ($P<0.05$) The highest digestibility coefficients of most nutrients (DM, OM, CF, EE and NFE) and subsequently the highest TDN and ME values. While, cows fed R2 had significantly

(P<0.05) the highest digestibility coefficient of CP and subsequently DCP value. However, cows fed the control ration (R1) showed the lowest TDN and ME values and those fed R4 had the lowest DCP value. These results are in agreement with those obtained by Shitta and Gaafar (2003), who found that the digestibilities of DM, OM, EE and NFE and subsequently TDN value increased, while CP and CF digestibilities and subsequently DCP value decreased with increasing level of vegetable marketing waste silage in the rations of lactating Friesian cows.

Table 1: Chemical composition of the tested feedstuffs and calculated composition of the experimental rations fed to lactating cows.

Item	DM %	Composition of DM %					
		OM	CP	CF	EE	NFE	Ash
Feedstuff							
Concentrate feed mixture (CFM)	88.20	94.30	16.35	11.11	2.52	64.32	5.70
Berseem hay (BH)	88.50	87.10	13.50	22.40	2.60	48.60	12.90
Berseem silage (BS)	23.60	86.15	16.14	22.22	2.70	45.09	13.85
Orange waste silage (OWS)	26.50	95.01	11.89	18.61	5.69	58.82	4.99
Rice straw (RS)	88.30	83.60	2.40	30.50	1.60	49.10	16.40
Experimental ration							
R1 (control)	88.29	90.54	13.01	17.50	2.36	57.67	9.46
R2 (75%BS + 25% OWS)	45.01	90.66	13.67	17.73	2.77	56.49	9.34
R3 (50%BS + 50% OWS)	45.46	91.41	13.29	17.44	3.04	57.64	8.59
R4 (25%BS + 75% OWS)	45.91	92.14	12.92	17.16	3.30	58.76	7.86

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

Item	Experimental ration				MSE
	R1	R2	R3	R4	
Digestion coefficients %:					
DM	65.08 ^{b}	69.55^{a}	70.28^{a}	61.87^{c}	1.09
OM	66.42^{b}	70.81^{a}	71.96^{a}	64.68^{b}	0.96
CP	50.08^{b}	63.14^{a}	59.46^{a}	47.17^{b}	2.01
CF	51.57^{a}	55.52^{a}	56.47^{a}	42.54^{b}	1.91
EE	62.07^{b}	75.90^{a}	77.35^{a}	75.02^{a}	1.94
NFE	74.78^{c}	77.19^{b}	79.24^{a}	74.28^{c}	0.69
Nutritive value:					
TDN %	61.97^{b}	66.83^{a}	68.71^{a}	62.69^{b}	0.89
ME Mcal / kg of DM*	2.31^{b}	2.53^{a}	2.61^{a}	2.34^{b}	0.01
DCP %	6.52^{c}	8.64^{a}	7.90^{b}	6.17^{c}	0.31

* ME Mcal / kg of DM = - 0.45 + 1.01 DE

DE Mcal / kg of DM = 0.04409 x TDN (%) [NRC, 1988].

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

Feed intake:

Average daily feed intake by lactating cows fed the experimental rations are shown in Table (3). Cows fed the control ration (R1) showed the highest intake of CFM and significantly ($P<0.05$) the highest DM, TDN, ME and CP intakes compared with the other groups. While, cows fed R2 had significantly ($P<0.05$) the highest intake of DCP. However, cows fed R2 had significantly ($P<0.05$) the lowest DM intake and those fed R4 had the lowest TDN, ME and DCP intakes. These results are in agreement with those obtained by Al-Shanti (2003), who found that intake of CFM, barley straw and DM intake were lower for cows fed orange waste silage than those fed the control ration. Shitta and Gaafar (2003) reported that intake of DM, TDN and DCP decreased with increasing level of vegetable marketing waste silage in the ration of lactating Friesian cows.

Table 3: Average daily feed intake of the experimental rations fed to lactating Friesian cows.

Item	Experimental ration				MSE
	R1	R2	R3	R4	
Feedstuffs intake	kg / head / day				
Concentrate feed mixture (CFM)*	12.00	8.00	8.00	8.00	-
Berseem hay (BH)*	5.00	-	-	-	-
Berseem silage (BS)*	-	16.00	11.00	6.00	-
Orange waste silage (OWS)*	-	6.00	11.00	16.00	-
Rice straw (RS)*	4.00	2.50	2.50	2.50	-
DM	18.54^{a}	14.63^{b}	14.77^{b}	14.92^{b}	0.49
TDN	11.49^{a}	9.78^{bc}	10.15^{b}	9.35^{c}	0.24
ME Mcal	42.83^{a}	37.01^{b}	38.55^{b}	34.91^{c}	0.25
CP	2.41^{a}	2.00^{b}	1.96^{b}	1.93^{b}	0.02
DCP	1.21^{ab}	1.26^{a}	1.17^{b}	0.92^{c}	0.04

* As fed.

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 shown in Table (4) revealed that ruminal pH values were nearly similar for the different groups. Cows fed R3 showed the highest ($P<0.05$) concentration of ruminal TVFA's (by increasing OWS to 50%) and those fed the control ration had the lowest ($P<0.05$) value. These results may be due to the significantly ($P<0.05$) highest energy value (TDN and ME) for R3 as shown in Table (2). Concentration of NH_3-N in rumen liquor decreased significantly ($P<0.05$) as the level of OWS increased in R3 and R4. These results may be attributed to the low level of CFM in R3 and R4. These results agreed with those obtained by Nour *et al.* (1981) and Tag El-Din *et al.* (1982), who found that ruminal NH_3-N concentration decreased as the level of citrus pulp or orange-peel increased.

Table 4: Rumen liquor parameters and blood plasma constituents of lactating Friesian cows fed the experimental rations.

Item	Experimental ration				MSE
	R1	R2	R3	R4	
Rumen liquor parameter:					
pH	6.29	6.22	6.19	6.26	0.05
TVFA's (meq/100 ml)	14.80^{c}	19.13^{ab}	22.30^{a}	16.87^{bc}	1.28
NH_3-N (mg/100 ml)	17.37^{ab}	18.59^{a}	16.03^{b}	14.14^{c}	1.05
Blood plasma constituent:					
Total protein (g/100 ml)	7.38^{b}	8.83^{a}	7.35^{b}	6.82^{c}	0.21
Albumin (g/100 ml)	4.15^{bc}	5.10^{a}	4.39^{b}	3.98^{c}	0.08
Globulin (g/100 ml)	3.23^{b}	3.73^{a}	2.96^{bc}	2.84^{c}	0.23
Albumin: globulin ratio	1.28^{c}	1.37^{b}	1.48^{a}	1.40^{ab}	0.03
Creatinine (mg/100 ml)	1.32^{b}	1.67^{a}	1.43^{b}	1.05^{c}	0.05
GOT (IU / L)	55.00^{a}	47.72^{b}	49.78^{b}	55.22^{a}	0.82
GPT (IU / L)	20.44^{a}	14.33^{c}	18.55^{b}	19.55^{ab}	0.29

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

Blood plasma constituents:

Concentrations of total protein, albumin, globulin, and creatinine as well as albumin to globulin ratio in blood plasma significantly (P<0.05) increased by introducing the lowest level of OWS in R2 and decreased by increasing its levels in R3 and R4 (Table 4). These results were associated with level of DCP in the experimental rations (Table 2) 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. Activity of transaminases (GOT and GPT) decreased significantly (P<0.05) with decreasing the level of OWS in R2 and R3, but was nearly similar to the control ration in R4 (Table 4). Blood parameters were within the normal levels of farm animals as indicated by Kaneko (1989), which means that the hepatic and nephritic functions associated with energy and protein metabolisms seem to be not affected by feeding OWS, indicating normal liver function of feeding lactating cows on OWS.

Milk yield and composition:

Results in Table (5) revealed that cows fed R3 recorded significantly (P<0.05) the highest actual milk yield, 4% FCM and fat, protein, lactose, total solids and solids not fat yields followed by cows fed R2. While cows fed the control ration had significantly (P<0.05) the lowest actual milk yield and yields of protein, lactose, total solids and solids not fat, while those fed R4 had the lowest yield of 4% FCM and fat. On the other hand, cows fed the control ration and R4 recorded significantly (P<0.05) the highest percentages of fat, lactose and total solids in milk. While, percentages of protein, solids not fat and ash did not differ significantly among the experimental groups. These results are within the values obtained by Khattab *et al.* (2000a) 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. Coulon *et al.* (1997) found that dairy cows fed grass silage yielded more milk than those fed hay.

Table 5: Average daily milk production and composition of lactating Friesian cows fed the experimental rations.

Item	Experimental ration				MSE
	R1	R2	R3	R4	
Actual milk yield (kg/ day)	17.41^{b}	19.48^{ab}	20.98^{a}	18.33^{ab}	0.14
4% FCM (kg/ day)	16.52^{b}	16.72^{b}	19.03^{a}	16.24^{b}	0.14
Milk composition (%)					
Fat	3.67^{a}	3.07^{b}	3.36^{ab}	3.24^{ab}	0.003
Protein	2.54	2.66	2.70	2.70	0.01
Lactose	4.62^{a}	4.43^{ab}	4.53^{ab}	4.36^{b}	0.006
Total solids	11.53^{a}	10.86^{b}	11.29^{ab}	11.00^{ab}	0.009
Solids not fat	7.85	7.79	7.93	7.76	0.01
Ash	0.70	0.70	0.70	0.70	0.0003
Milk content yield (kg/day)					
Fat	0.64^{ab}	0.59^{b}	0.71^{a}	0.59^{b}	0.006
Protein	0.44^{b}	0.52^{ab}	0.57^{a}	0.50^{ab}	0.006
Lactose	0.80^{b}	0.86^{ab}	0.95^{a}	0.80^{b}	0.006
Total solids	2.01^{b}	2.11^{ab}	2.37^{a}	2.02^{b}	0.02
Solids not fat	1.37^{b}	1.51^{ab}	1.67^{a}	1.43^{ab}	0.01

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

Feed conversion and economic efficiency:

Feed conversion and economic efficiency of lactating Friesian cows fed the experimental rations are shown in Table (6). Cows fed R3 showed significantly (P<0.05) the highest feed utilization followed by those fed R2, while those fed the control ration showed the lowest feed utilization. This was attributed to that cows fed R3 recorded the lowest amounts of DM, TDN and DCP per kg 4% FCM, while those fed the control ration had the highest amounts. The previous results are in accordance with those obtained by Mahmoud *et al.* (1992) who 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 increasing feed efficiency. Shitta and Gaafar (2003) found that protein and energy utilizations of lactating cows fed vegetable marketing waste silage were higher than those fed control ration. Recently, Mohi El-Din and Swify (2004) indicated that feeding lactating cows on corn silage led to increasing feed conversion and economic efficiency.

Moreover, average daily feed cost and feed cost per 1 kg FCM for cows fed the control ration was significantly (P<0.05) higher than the other groups and tended to decrease with increasing the level of OWS in the rations. These results may be attributed to higher CFM intake for the control group than the other groups (12 vs. 8 kg, respectively) and to the higher price of CFM (1200 L.E. /ton) than price of silage (90 L.E. / ton of BS and 50 L.E. / ton of OWS). The income of 4% FCM yield revealed similar trend, which cows fed R3 revealed the highest income followed by those fed R2. However, those fed R4 had the lowest income. Economic efficiency for cows fed the control ration (R1) was significantly (P<0.05) lower than the other silage groups. While, cows fed R3 showed significantly (P<0.05) the highest economic efficiency (2.54) and those fed the control ration had the lowest efficiency (1.39). These results are in agreement with those obtained by

Kholif and Abo El-Nor (1998), who found that using industrial by-products in goat ration reduced feeding cost. Al-Shanti (2003) reported that feeding OWS led to decrease feed cost and increased income of 4% FCM and subsequently led to higher economic efficiency than the control group.

Table 6: Feed conversion and economic efficiency of lactating Friesian cows fed the experimental rations.

Item	Experimental ration				MSE
	R1	R2	R3	R4	
Feed conversion					
DM kg/ kg FCM	1.12[a]	0.88[b]	0.78[c]	0.91[b]	0.03
TDN kg/ kg FCM	0.70[a]	0.58[b]	0.49[c]	0.63[ab]	0.02
DCP g/ kg FCM	73.24[a]	75.36[a]	48.34[b]	72.04[a]	2.48
Economic efficiency					
Daily feed cost (LE)	17.89[a]	11.49[b]	11.29[b]	11.09[b]	0.46
Feed cost (LE) / kg FCM	1.08[a]	0.69[b]	0.59[b]	0.68[b]	0.06
4% FCM income (LE)	24.78[b]	25.08[b]	28.55[a]	24.36[b]	0.75
Economic efficiency	1.39[b]	2.17[a]	2.54[a]	2.21[a]	0.09

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

In conclusion, using berseem and orange waste silages as a source of roughage is more efficient especially during summer season under Egyptian conditions to replace berseem hay and to save a part of concentrate feed mixture. Using 50% berseem silage and 50% orange waste silage as a roughge replacement in the rations of lactating cows resulted in higher milk production and higher feed utilization and economic efficiency.

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تأثير التغذية على سيلاج البرسيم ومخلفات عصر البرتقال علـــى الأداء الإنتـــاجى لأبقار الفريزيان الحلابة

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أجريت هذه الدراسة على ١٢ بقرة فريزيان حلابة ما بين الموسم الثانى والرابع، متوسط وزنها ٤٥٠ + ١٧,٠ كجم وزعت عشوائيا إلى أربعة مجاميع متماثلة. غذيت أبقـــار المجموعـــة الأولى على عليقة المقارنة (أ) ٦٠% علف مركز + ١٥% قش أرز + ٢٥% دريس برسيم، بينما غذيت أبقار المجاميع الثانية والثالثة والرابعة على العلائق ٢، ٣، ٤ والتى تتكون من ٥٠% علـف مركز + ١٥% قش أرز + ٣٥% مخلوط من سيلاج البرسيم وسيلاج مخلفات عصـــر البرتقـــال بنسبة ٢٥:٧٥ للمجموعة الثانية، ٥٠:٥٠ للمجموعة الثالثة، ٧٥:٢٥ للمجموعة الرابعة.

أوضحت النتائج الآتى:-

١- انخفاض محتوى البروتين الخام والألياف الخام والرماد وارتفاع محتوى المستخلص الايثيرى والمستخلص الخالى من الأزوت فى سيلاج مخلفات عصـــر البرتقـــال بالمقارنـــة بســـيلاج البرسيم.

٢- زيادة محتوى البروتين الخام والألياف الخام والرماد ونقص محتوى كل من المادة العضويـــة والمستخلص الاثيرى والمستخلص الخالى من الأزوت مع زيادة مســـتوى ســـيلاج البرســـيم ونقص مستوى سيلاج مخلفات عصر البرتقال فى العلائق المختبرة.

٣- أظهرت الأبقار المغذاة على العليقة الثالثة معنويا (على مستوى ٠,٠٥) أعلى معاملات هضـــم للمادة الجافة والمادة العضوية والألياف الخام والمستخلص الاثيرى والمستخلص الخالى مـــن الأزوت وبالتالى محتوى مجموع المركبات الغذائية المهضومة والطاقة الممثلة. بينما أظهرت الأبقار المغذاة على العليقة الثانية أعلى معامل هضم للبروتين الخام وبالتالى محتوى الـــبروتين الخام المهضوم.

٤- أظهرت الأبقار المغذاة على عليقة المقارنة أعلى مأكول من العلف المركز وقش الأرز والمادة الجافة والمركبات الغذائية المهضومة والطاقة الممثلة والـــبروتين الخـــام معنويـــا بالمقارنـــة بالمجاميع الأخرى المغذاة على السيلاج. بينما أظهرت المجموعة الثانية معنويا أعلى مـــأكول من البروتين الخام المهضوم.

٥- كانت قيمة درجة الحموضة فى سائل الكرش متماثلة تقريبا للمجاميع التجريبية. بينما أظهرت الأبقار المغذاة على العليقة الثالثة أعلى تركيز للأحماض الدهنية الطيارة الكلية (على مســـتوى ٠,٠٥). ارتفاع تركيز نيتروجين الأمونيا معنويا فى سائل الكرش مع زيادة مستوى ســـيلاج البرسيم ونقص مستوى سيلاج مخلفات عصر البرتقال فى العليقة.

٦- زاد تركيز البروتينات الكلية والألبيومين والجلوبيولين والكرياتينين وقـــل نشـــاط الأنزيمـــات الناقلة لمجموعة الأمين (GOT & GPT) معنويا فى بلازما الدم مع زيـــادة مســـتوى ســـيلاج

البرسيم ونقص مستوى سيلاج مخلفات عصر البرتقال فى العليقة ولكن كانت القيم فى الحدود الطبيعية.

٧- أظهرت أبقار المجموعة الثالثة معنويا (على مستوى ٠,٠٥) أعلى انتاج للبن الفعلى واللبن المعدل ٤% دهن ومكونات اللبن المختلفة تليها المجموعة الثانية. بينما أظهرت أبقار مجموعة المقارنة معنويا أعلى محتوى للدهن واللاكتوز وأبقار المجموعة الثالثة أظهرت أعلى محتوى للجوامد الصلبة الكلية. لم يكن هناك اختلافات معنوية فى محتوى البروتين والجوامد الصلبة اللادهنية والرماد بين المجاميع التجريبية.

٨- سجلت أبقار المجموعة الثالثة معنويا أعلى كفاءة غذائية واقتصادية، بينما أظهرت أبقار مجموعة المقارنة أقل القيم.

من هذه الدراسة نستخلص أنه يمكن استخدام سيلاج البرسيم وسيلاج مخلفات عصر البرتقال خلال فصل الصيف بدلا من دريس البرسيم مع توفير جزء من العلف المركز حيث أن استخدام مخلوط مكون من ٥٠% سيلاج برسيم و ٥٠% سيلاج مخلفات عصر البرتقال كمادة مالئة فى علائق الأبقار الحلابة حقق أعلى انتاج من اللبن وأعلى كفاءة غذائية واقتصادية.