COMPARISON BETWEEN THE EFFECTS OF FEEDING CORN SILAGE OR BERSEEM AS A BASAL DIET ON: 2-DIGESTION COEFFICIENTS, FEED INTAKE, SOME BLOOD PARAMETERS AND SOME RUMEN PARAMETERS OF LACTATING FRIESIAN COWS

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SUMMARY

Twelve lactating Friesian cows with an average body weight of 490-560 kg in the second to fourth lactation seasons were randomly distributed into three similar groups (four for each group). All groups were individually fed according to NRC (2001) recommendations. The three experimental rations were formulated as follows: (Control): 40 % concentrate feed mixture (CFM) + 32 % rice straw (RS) + 28 % corn silage (S), (T1): 40 % (CFM) + 32 % (RS) + 28 % berseem (B) and (T2): 40 % (CFM) + 32 % (RS) + 14 % (S) + 14 % (B). Three digestibility trials were conducted to determine nutrients digestibility coefficients and nutritive values of the experimental rations. Each digestibility trial consisted of 15 days preliminary period followed by 7 days collected period. Results showed that the digestibility coefficients of OM was significantly ($p<0.05$) higher with feeding on T2 than feeding on T1, but without significant difference with feeding control ration. The NFE digestibility was significantly ($p<0.05$) higher in T2 compared with the control or T1. The nutritive values expressed as TDN, ME, NE and RFV were significantly ($p<0.05$) higher with feeding on the control and T2 than feeding on T1. The mean value of rumen pH was decreased ($p<0.05$) when feeding the control ration compared with T1 (6.73 and 7.15, respectively). The same trend was observed on ruminal eNDF%. There were no significant effects among the treatments, regarding ruminal VFAs and NH3 concentrations. There were no significant effects of treatments on microbial count of fibrolytic or amylolytic bacteria, but feeding control or T2 rations were increased the microbial count mainly fibrolytic bacteria in the rumen than feeding on T1. Feeding on T1 ration increased amylolytic bacteria than feeding on the control or T2. There were significant effects on blood lipten, insulin, free fatty acids and triglycerides concentrations. The concentrations were higher ($p<0.05$) when feeding on T1 than feeding on control and T2 or when feeding on T2 than feeding on the control ration. The NEFA and urea concentrations were higher when feeding on T1 than feeding on the control ration but there were no significant effects when feeding on T1and T2 or between the control and T2. The results showed that there were no significant effects on glucose, cholesterol and total protein concentrations when animals were fed the experimental rations. So, feeding on the T2 showed appropriate similar results as that obtained with the control ration in terms of nutrient digestibility, feeding values, rumen parameters and blood parameters.

Keywords: *lactating Friesian cows, corn silage, berseem, digestibility coefficients, nutritive values, ruminal parameters and blood parameters.*

INTRODUCTION

Corn silage contains a moderate to high level of digestible energy, but it is low to moderate in digestible protein. As the corn matures the fibre content decrease and the energy content increase, this is directly due to the increase of grain content. Corn silage is low in calcium and trace minerals and contains fair levels of phosphorus. Crude protein of corn silage is about 7-9% on a dry matter basis. However, high corn silage diets can produce variable results due to potential variation in the ruminal digestion of starch and fiber, which can negatively impact dry matter intake (DMI) and resulting performance (Allen et al., 2009).

Improving and maintaining high quality forage is the key to developing a sound ration program. On semi-natural grasslands, often the cutting date is delayed and fertilization is restricted, resulting in high cell wall concentrations, low protein concentrations and low digestibility, and thus a low metabolizable energy (ME) concentrations. This would result in a relatively low milk production if this type of forage is

included in the diet of dairy cows. In temperate regions, the diet of lactating cows often contains concentrates, maize silage and grass (Beever et al. (2000). Usually the grass is harvested early and has a high digestibility and high protein concentrations and thus a high metabolizable energy (ME) concentration. Cows are therefore expected to reach high milk production on diets containing this type of grass. Voluntary intake is often related to dry matter digestibility, structural carbohydrate content and breakdown capacity in the rumen (Derrick et al, 1993). Intake of forages from semi-natural grasslands is found to be lower than intake from ryegrass and clover swards, mainly attributed to differences in digestibility. The intake of legumes is higher than that of grasses, which may be attributed to higher crude protein concentration, lower cell wall content, faster particle size reduction in the rumen and faster rate of organic matter removal from the rumen (Wilman et al, 1997). Also with some dicotyledonous species, high voluntary intake can be observed, despite a high NDF concentrate. This might be due to the fact that tissues of dicot species are easier to break down in the rumen than those of grasses. When such forages are produced anyway, it would be best to feed such forages in combination with forages or feeds with a low protein concentration, such as maize silage. Also the inclusion of straw or forages from semi-natural grasslands would have a positive effect by increasing the ingested fibre and decreasing the ingested nitrogen (Valk et al, 2000).

High quality corn silage contributes greatly to supplying the energy, starch and forage neutral detergent fibre (NDF) needs of dairy cows. Forage comprised 50 to 60% of total mixed ration DM with up to 24% NDF from forage DM. Corn silage comprised 40 to 70% of the forage DM. Corn silage contributed more than alfalfa with regard to dietary starch, while alfalfa contributed more than corn silage with regard to dietary CP. Both contributions are important for reducing feed costs at this time, as both corn grain and protein supplements are relatively expensive (Ferraretto and Shaver, 2012).

Furthermore, because of the high growth rate of the heavily fertilized grasslands, the forage is harvested early in a young stage of maturity. The stem to leaf ratio is then low, the cell wall and lignin concentrations are low and the proportion of easily digestible cell content is high (Beever et al, 2000). This lead to in high digestibility and a high protein concentrations and thus in high quality of the forage. Due to the delay in harvesting, cell wall and lignin concentrations are usually high and concentrations of cell contents are low, resulting in a low digestibility and a low protein concentrations and thus in a low quality of the forage. The positive effects of maize silage may be attributed to a positive effect of slowly degradable starch on milk yield (Nocek and Tamminga, 1991), the equalization of the degradation of energy and protein in the rumen and thus a more efficient production of microbial protein (Clark et al, 1992) or improved utilization of protein and energy.

The main objective of this project, therefore, was to compare among the effects of corn silages or berseem or both as feed ingredients on the nutrition value, rumen liquor parameters, bacteria strains and fermentation in lactating Friesian cows.

MATERIALS AND METHODS

The present study was conducted at El-Karada, Animal Production Research Station, Animal Production Research Institute, Agricultural Research Centre, Ministry of Agricultural. Twelve lactating Friesian cows from the herd of the stations, with an average live body weight ranging from 490-560 kg in the second to fourth lactation season were randomly distributed into three similar groups (four for each group) to study the effect of the tested rations on nutrients digestibility coefficients, nutritive values, ruminal parameters and blood parameters. All groups were individually fed according to NRC (2001) recommendations. The three experimental rations were formulated as follows: Control: 40 % concentrate feed mixture (CFM) + 32 % rice straw (RS) + 28 % corn silage (S), T1: 40 % (CFM) + 32 % (RS) + 28 % berseem (B) and T2: 40 % (CFM) + 32 % (RS) + 14 % (S) + 14 % (B). The CFM contained wheat brain, undecorticated cotton seed meal, yellow corn, molasses and salt.

The concentrate feed mixture was offered firstly at morning, while corn silage or berseem and rice straw was offered after consumption of the concentrate feed mixture. Drinking fresh and clean water was available at all times.

Three digestibility trials were conducted using three cows chosen randomly from each group. Each digestibility trial consisted of 15 days preliminary period followed by 7 days collected period. During the digestion trials, cows were fed their allowances according to the experimental assignment of each group. Acid insoluble ash (AIA) was used as a natural marker *(*Van keulen and Young, 1977). Nutrients digestibility was calculated from the equations stated by Schneider and Flatt (1975).Samples of CFM, S,

B and RS were taken at the beginning, middle and at the end of each trial. At the end of the collection period composite samples were dried in a forced air oven at 65°C for 48 hours, then ground and kept for chemical analysis. Feces samples (F) were taken from the rectum of each cow twice daily with 12 hours interval during the collection period of each trial and dried in a forced air oven at 65°C for 48 hours. Dried samples were composted for each cow and representative samples were taken, ground and kept for chemical analysis. Chemical analysis of samples of CFM, S, B, RS and F were carried out to determine dry matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE), ash and fiber fractions (NDF,ADF ADL, Hemi. and Cell.) according to the methods of AOAC (1990).

Ruminal fluid samples were taken during the digestibility trials from each animal individually using stomach tube before feeding and at 2, 4 and 8 hrs post- feeding. The collected rumen fluid samples were filtered through three layers of gauze without squeezing for the determination of pH, ammonia-N and total volatile fatty acids (TVFA`s). Ruminal pH was estimated by pH meter (Orion Research, model 201 digital pH meter). Ruminal ammonia-N was determined according to Conway (1957). The TVFA`s were determined by the steam distillation method as described by Warner (1964). Fibrolytic bacteria (included Fibrobacter succinogenes) counting medium, the Hungate anaerobic culture method as described by Varel and Jung (1986) was used, the composition of the cellulose and xylan agar plate medium per 100ml. Amylolytic bacteria (included Streptococcus bovis) counting medium, Azide dextrose agar was used for counting S. bovis by Abshire (1977).

Blood samples were taken from the jugular vein before feeding and at 2, 4 and 8hrs post- feeding from same three animals of each treatment of the digestibility trials. Blood samples were separated by centrifugation at 4000 r.p.m for 10 minutes. The serum samples were frozen at –20°C until analysis for Leptin, Insulin, FFA, Glucose, Cholesterol, Triglycerides, Total protein, urea and NEFA (Non esterified fatty acids). Different items of the blood picture tested in this experiment were carried out according to the corresponding references illustrated in the following illustration using commercial Kits,

Criteria	References
Leptin	Ahima and Flier (2000)
Insulin	Cohen *et al*. (1996)
FFA	Zollner and Kirsch (1962)
Glucose	Trinder (1969)
Cholesterol	Allain *et al*. (1974)
Triglycerides	Fossati and Prencipe (1982)
Total Protein	Gornall *et al*. (1949)
Urea	Faweett and Scott (1960)
NEFA (Non esterified fatty acids)	Cunningham (1992)

Data were statistically analyzed by variance test method according to Snedecor and Cochran (1982) while the differences among means were tested using Duncan's Multiple Test (Duncan, 1955).

RESULTS AND DISCUSSION

Chemical composition of the experimental ingredients and rations (table 1) clearly showed that berseem contained higher CP, CF, hemicellulose, ANDF, ash and lower OM, EE, NFE, ADF, cellulose, ADL, NFC, UNDF than corn silage. However, both B and S contained similar values of NDF and NDS. The proportion of fibre (ADF) to cell soluble (NDS) is a major determinant of energy availability in forages (Buxton and Redfeam, 1997). Generally, the summative proximate chemical analysis of CFM, S, B and RS (Table 1) used to formulate the experimental rations were within the normal published ranges (Maklad, 1996 and Sayed-Ahmed, 2001). Dairy producers should consider lowering crude protein (CP) levels in rations for two primary reasons. One is to improve profitability by increasing the efficiency of converting feed nitrogen | (N) intake to milk N output while at least maintaining milk production. A second reason is that feeding lower CP rations decreases the excretion of N to the environment and lowers

ammonia emissions (Olmos Colmenero and Broderick, 2006). The efficiency of N use for milk production (defined as kg of milk N output per kg dietary N intake) was 0.42, 0.33 and 0.35 for dietary CP concentrations of 114, 144 and 173 g/kg DM respectively, during early (is the first 150 days) lactation (Huhtanen and Hristov, 2009). The amino acid composition of microbial protein is superior to that of UDP, so that dietary strategies that aim to promote microbial protein synthesis in the rumen may go some way to correcting amino acids imbalances in low CP diet.

The average daily dry matter intake of concentrate feed mixture, corn silage, berseem and rice straw by cows is presented in Table (2). The average daily of total dry matter intake as % of body weight (BW) was 3.18, 3.04 and 3.13 for the control, T1 and T2, respectively. Voluntary intake is often related to dry matter digestibility, structural carbohydrate content and breakdown capacity in the rumen (Derrick et al., 1993).

Results of nutrients digestibility of the experimental rations (Table 3) indicated that T2 recorded the highest values of all nutrients; however, the lowest values were recorded for T1 except hemicellulose and ADL. The significant differences were detected between treatments for OM, EE and NFC. The nutritive values expressed as TDN, ME and NE followed the same trend as those of nutrients digestibility. The Exp. 2 showed the highest significant ($p<0.05$) values while Exp. 1 recorded the lowest ones.

The relationship between NDF concentration and digestibility or lignin concentration and digestibility vary between species, especially between grasses and dicotyledonous species.With regard to the relationship between NDF concentration and digestibility, dicotyledonous species contain high amounts of pectins (Wilson, 1994) that are not determined in the NDF method. Pectins are almost completely digested in the rumen (Tamminga, 1993), so digestibility will not be influenced negatively. In some cases a low digestibility of forage is not only caused by the chemical composition of the cell wall, but also by anti-nutritional factors such as tannins or silica (Rezvani Moghaddam and Wilman, 1998). In many dicotyledonous species secondary metabolites are found which have an inhibitory effect on the digestibility (Scehovic, 1997). However, in small amounts (below 0.30 or 0.40) the occurrence of dicotyledonous species in the forage mixture can be beneficial to forage quality (Scehovic, 2000).

Data of rumen parameters (Table 4) showed that pH was decreased ($p<0.05$) when feeding the control ration compared with T1 (6.73 and 7.15, respectively), while there was no significant difference between the control ration and T2 or between T1 and T2. The same trends were observed on eNDF%. The mean values of the VFA or NH3 concentrations showed that there were no significant differences among treatments.

Consideration of ruminal digestibility of NDF and starch from corn silage is necessary to maximize digestible energy intake of corn silage-based diet. The pH of the ruminal contents is probably the most important ruminal factor affecting the microbial population and their activities. In a study published by Cerrato-Sanchez et al (2008), digestibility values and concentrations of VFA's and ammonia were not affected by maintaining pH 5.6 for 4h or fluctuating pH between 5.1 (2h/d) and 7.1(2h/d), but were affected to some extent by maintaining a pH of 5.1 for 4h. Effective NDF (eNDF) was included to estimate adjustments in ruminal PH useful only when eNDF was below 30%. Fibre digestion is at ruminal levels (PH about 6.2 optimal) when eNDF is at least 20%. When NDF drops below 20%, bacterial yield is decreased by 2.5% for each 1% decrease in NDF. The optimal concentrations of ruminal ammonia-N required to maximize microbial protein synthesis are controversial, but 5mg/100ml of ammonia-N maximized microbial protein synthesis in vitro (Karsli and Russell, 2002). The microbial growth was limited at ruminal ammonia concentrations closer to 2mg ammonia-N/100ml however; excessive level of ammonia-N up to 80mg/100ml did not increase microbial growth.

Effect of feeding experimental rations on fibrolytic and amylolytic bacteria at different times are shown in Table (5) and Figures (1 and 2).

Data clearly showed that control diet recorded the highest fibrolytic bacteria counts followed by T2, but recorded lower amylolytic bacteria counts than T1. The major fibrolytic bacteria include fibrobacter succinogenes and two species, Ruminococcus albus and Ruminococcus flavefacians. Optimal fiber degradation and ruminal fermentation will occur when ruminal conditions produce an environment conductive to the growth of these organisms. Fibrobacter succinogenes possesses a complex battery of fibrolytic enzyme which is capable of digesting crystalline cellulose (Ushida et al, 1990).

Many species of rumial bacteria actively degrade starch and/or utilize the intermediate products of starch degradation (amylodextrins, maltose and glucose) Nagaraja and Titgemeyer (2007), forming lactate as an end product of fermentation. The numerically predominant starch degrading organisms with the highest amylolytic activity and the fastest growth rates are Ruminobacter amylophilus, Streptococcus bovis and Selenomonas ruminantium. Rumen microorganisms are categorize into those that ferment fibre carbohydrates (FC) and non-fibre carbohydrates (NFC) as described by Russell et al, (1992). The FC

Table (1) : The chemical composition of the ingredients and experimental rations.

Item	DM	Chemical composition (% as DM)														
		OM	CP	EE	CF	NFE	Ash	NDF	ADF	Hemi.	Cell.	ADL	NFC*	UNDF[1]	ANDF[2]	NDS[3]
Ingredients																
Concentrate feed mixture	91.25	84.36	13.69	2.29	11.35	57.03	15.64	39.91	23.00	16.91	14.00	9.00	29.41	8.62	31.29	60.09
Corn Silage	30.95	88.07	10.67	3.31	21.24	52.95	11.93	44.34	33.02	11.32	27.67	5.35	31.65	5.69	38.65	55.66
Berseem	13.01	84.60	19.08	1.65	25.50	38.37	15.40	44.91	27.06	17.85	24.43	2.63	20.66	2.84	42.07	55.09
Rice straw	90.19	80.99	3.87	1.56	32.78	42.78	19.01	74.47	59.84	14.63	43.24	16.60	3.80	29.67	44.80	25.53
Experimental rations																
Control	74.99	84.42	9.82	2.36	20.74	51.50	15.58	51.76	37.15	14.61	26.86	10.29	22.20	12.78	38.98	48.24
T1	70.19	83.35	12.05	1.88	22.17	47.25	16.65	52.38	35.94	16.44	26.28	9.66	18.75	12.14	40.24	47.62
T2	72.42	83.99	10.83	2.08	21.30	49.78	16.01	52.21	36.43	15.78	26.62	9.81	18.87	12.29	39.92	47.79

Control: 40% CFM + 32% RS + 28% S; Exp.1: 40% CFM + 32% RS + 28% B; Exp.2: 40% CFM + 32% RS + 14% S + 14% B.

** Non fiberous carbohydrates%= OM% - (CP %+ NDF %+ EE %), Calsamiglia et al., 1995.*

(1) UNDF: Unavailable NDF = NDF x 0.01 x ADL x 2.4 (Fox et al., 2000). (2) ANDF: Available NDF = NDF – UNDF (3) NDS: Neutral detergent solubles = 100 – NDF

ADF / NFC: (Berseem = 1.3) & (Corn Silage = 1.04). ADF / NDS: (Berseem = 0.49) & (Corn Silage = 0.59).

Table (2): Effect of the experimental rations on DM intake.

Item	Control	T1	T2
Average body weight (kg)	522	538	529
Concentrate : Roughage	40.81 : 59.19	40.04 : 59.96	40.47 : 59.53
Intake of (DM): Concentrate Feed Mixtur (CFM) :			
Kg/h/d	6.77	6.54	6.69
% BW	1.30	1.22	1.27
Intake of (DM): Corn Silage (S) :			
Kg/h/d	4.74	0.00	2.34
% BW	0.91	0.00	0.44
Intake of (DM): Berseem (B) :			
Kg/h/d	0.00	4.55	2.25
% BW	0.00	0.85	0.41
Intake of (DM): Rice straw (RS) :			
Kg/h/d	5.08	5.23	5.18
% BW	0.97	0.97	0.98
Total dry matter intake:			
Kg/h/d	16.59	16.33	16.56
% BW	3.18	3.04	3.13

Table(3): Effect of the experimental rations on the digestion coefficients and feeding values by dairy cows.

Item	Control	T1	T2
Nutrient digestibility (%):			
DM	73.37 ± 2.289	70.0 ± 3.827	75.75 ± 2.325
OM	75.29^{ab} ± 1.990	71.57^{b} ± 3.606	77.59^{a} ± 2.167
CP	73.09 ± 6.532	69.15 ± 6.645	75.15 ± 2.098
EE	83.69^{a} ± 3.704	60.64^{b} ± 8.900	76.26^{a} ± 5.967
CF	56.75 ± 4.332	53.60 ± 5.990	58.30 ± 1.525
NFE	81.96 ± 3.925	80.03 ± 2.266	85.59 ± 2.725
NDF	67.75 ± 2.659	65.45 ± 3.946	70.37 ± 2.825
ADF	66.66 ± 3.726	63.11 ± 8.862	68.56 ± 4.238
Hemi.	70.52 ± 3.938	70.57 ± 7.922	74.54 ± 2.905
Cell.	75.18 ± 2.529	68.11 ± 9.255	75.70 ± 4.138
ADL	44.39 ± 6.938	49.45 ± 8.813	49.58 ± 6.272
NFC	92.96^{b} ± 1.251	91.32^{b} ± 2.099	97.36^{a} ± 2.007
Feeding value (%):			
TDN	65.60^{a} ± 1.832	60.59^{b} ± 3.207	66.67^{a} ± 1.958
DCPDCP	7.18 ± 0.567	8.33 ± 0.675	8.19 ± 0.204
ME(Mcal/kg)	2.34^{a} ± 0.046	2.16^{b} ± 0.013	2.37^{a} ± 0.052
ME(Mj/Kg)	9.77^{a} ± 0.451	9.02^{b} ± 0.483	9.93^{a} ± 0.364
NE(Mcal/Kg)*	1.49^{a} ± 0.054	1.36^{b} ± 0.071	1.51^{a} ± 0.059
DDM%**	55.02^{a} ± 1.607	49.14^{b} ± 2.792	55.03^{a} ± 1.890
RFV***	135.64^{a} ± 3.832	115.85^{b} ± 1.249	132.87^{a} ± 5.523

a, b and c : Means within the same raw with different superscripts are significantly different (p<0.05).

** NE (Mcal / kg) = (TDN% x 0.0245) – 0.12 (NRC, 2001). ** DDM% of DM = 88.9 – 0.779 x (ADF% of DM) (Schroeder, 1996). *** RFV = DMI x DDM / 1.29 (Schroeder, 1996).*

Table (4): Effect of feeding experimental rations on some rumen liquor parameters at different times of sampling.

Item		Control	T1	T2
Parameters	Hours			
pH-Values	0	7.31	7.37	7.35
	2	6.45	6.93	6.76
	4	6.56	6.94	6.71
	8	6.61	7.34	7.05
	Means	6.73 [b]	7.15 [a]	6.96 [ab]
NH_3-N (mg/100ml)	0	14.0	13.0	13.0
	2	8.0	5.0	6.0
	4	11.0	7.0	10.0
	8	6.0	8.0	8.0
	Means	10.0	8.0	9.0
Total VFA's (ml eq/100ml)	0	3.13	3.70	3.40
	2	5.50	5.63	5.47
	4	4.20	3.90	4.10
	8	4.33	3.97	4.07
	Means	4.29	4.30	4.26
%eNDF*		32.06 [b]	40.75 [a]	36.21 [ab]

a, b and c : Means within the same raw with different superscripts are significantly different (p<0.05).
** % eNDF = (pH - 5.425) / 0.04229 (Fox et al., 2000).*

Table (5): Effect of the experimental rations on some Microbial count in the rumen liquor at different times of sampling.

Item	Hours	Control	T1	T2
Fibrolytic bacteria (Microbial count x 100000 CFU/ml)	0	7.00	5.00	6.00
	2	9.03	7.00	8.17
	4	9.00	5.30	7.25
	8	10.00	8.07	9.13
	Mean	8.73	6.34	7.64
Amylolytic bacteria (Microbial count x 100000 CFU/ml)	0	2.67	1.57	2.12
	2	4.73	1.80	3.32
	4	3.07	1.93	2.50
	8	6.13	12.53	9.48
	Mean	4.15	4.46	4.36

microorganisms ferment cellulose and hemicellulose and grow more slowly and utilize ammonia as their primary N source for microbial protein synthesis. The NFC microorganisms ferment starch, pectin and sugars grow more rapidly and can utilize ammonia and amino acids as N sources.

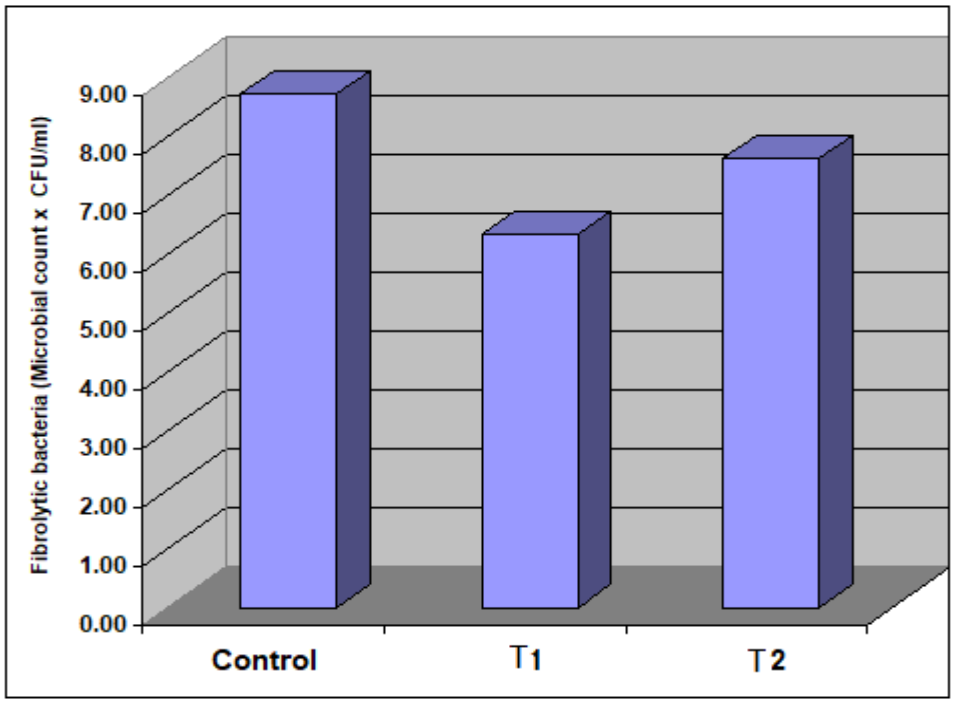

Figure (1): Effect of feeding experimental rations on the mean value of rumen Fibrolytic bacteria.

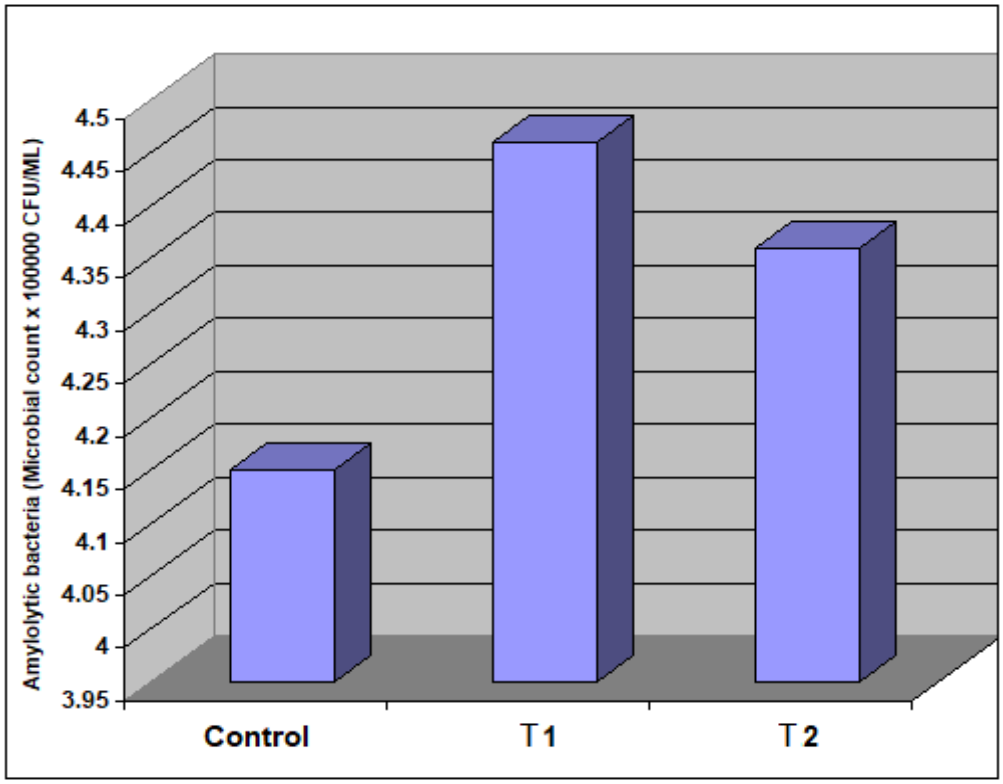

Figure (2): Effect of feeding experimental rations on the mean value of rumen Amylolytic bacteria.

It is of interest notice (Table 6) that control ration recorded the significant ($p<0.05$) lowest values of blood serum NEFA, lipten, insulin, FFA, triglycerides, urea and non-significant ($p>0.05$) highest values of blood serum glucose, cholesterol and triglycerides. However T1 recorded significant highest

values of blood serum FFA, lipten, insulin, urea and non-significant highest values of blood serum glucose and TP.

The highest concentrations of glucose, insulin, lipten, and blood triglycerides as well as the lowest NEFA level observed from day 7 before calving to day 14 of lactation and the lowest condition losses during the transition period could confirm the positive influence of starch on energy balance. The concentrations of blood urea nitrogen (BUN) reflect the diet energy and nitrogen balance for rumen microorganisms to protein synthesis (Mikula et al, 2011). Depeters and Ferguson (1992), claimed that BUN concentrations is reduced with an increase in the amount of rapidly fermenting NFC in feed ration.

Summing up, ruminant animals maintain low blood glucose concentration (<70 mg/100ml) compared to nonruminant animals (>80 mg/100ml). Low blood glucose is the result of microbial fermentation of dietary sugars and starches to the VFA propionate, with minimal glucose being presented to the small intestine for absorption. In contrast to ruminants, Llamas and alpacas display an extreme hyperglycaemic response (blood glucose concentrations >200mg/100ml) in response to even minimal stress situations. Elevated blood glucose can be some what explained by a sluggish insulin response (Cebra et al, 2001).

From the foregoing results, it could be concluded that the effects of NFC on production have often been attributed to their relatively greeter digestibility than fibre and their effects on ruminal fermentation often related to pH effects. When degradable protein was not limiting, NDF fermentation was improved over the responses with starch with feeding of sugars. The sugar fermentation should peak before starch fermentation, with starch fermentation possibly achieving its peak closer in time to the peak of the NDF fermentation. So, feeding on the T2 ration showed appropriate similar results in terms of nutrient digestibility coefficients, feeding values, rumen and blood parameters as that obtained with the control ration.

Table (6): Effect of experimental rations on some blood serum parameters

Item	Hours	Control	T1	T2
Non-estrified fatty acids (NEFA) m Eq/L	0	0.17	0.24	0.19
	2	0.23	0.22	0.24
	4	0.17	0.45	0.33
	8	0.84	1.57	1.24
	Mean	0.33 [b]	0.63 [a]	0.50 [ab]
Lipten ng/ml	0	0.60	2.77	1.68
	2	3.17	4.21	3.67
	4	3.20	3.80	3.60
	8	2.83	3.90	3.37
	Mean	2.41 [c]	3.67 [a]	3.08 [b]
Insulin ng/ml	0	0.15	0.27	0.20
	2	0.21	0.28	0.24
	4	0.17	0.29	0.23
	8	0.20	0.22	0.23
	Mean	0.18 [c]	0.28 [a]	0.22 [b]
Free fatty acids (FFA) mg%	0	5.32	7.89	6.58
	2	7.82	9.79	8.80
	4	10.38	10.91	10.70
	8	10.60	11.62	11.15
	Mean	8.53 [c]	10.06 [a]	9.31 [b]
Glucose mg%	0	112.80	129.52	121.16
	2	116.39	117.96	116.18
	4	117.44	175.70	146.57
	8	177.06	158.83	166.95
	Mean	130.12	145.50	137.71
Cholestrol mg%	0	66.09	52.66	60.87
	2	53.10	37.16	45.78
	4	43.03	40.25	41.84
	8	31.17	41.05	35.61

	Mean	47.62	42.43	46.03
	0	312.91	231.26	277.38
	2	281.38	291.17	289.18
Triglycerides mg%	4	191.05	112.55	153.80
	8	147.08	132.80	143.44
	Mean	233.35 [a]	193.55 [c]	215.95 [b]
	0	5.32	6.69	5.96
	2	6.09	3.95	5.12
Total protein (TP) g%	4	3.85	5.17	4.55
	8	4.92	4.64	4.76
	Mean	5.04	5.12	5.10
	0	4.48	9.10	6.99
	2	12.28	16.87	14.93
Urea mg%	4	16.64	21.30	19.22
	8	28.36	42.70	36.53
	Mean	15.44 [b]	22.50 [a]	19.42 [ab]

a, b and c : Means within the same raw with different superscripts are significantly different ($p<0.05$).

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مقارنة بين تأثير التغذية على سيلاج الأذرة أو البرسيم كعليقة أساسية على ٢- معاملات الهضم، المأكول، بعض قياسات الدم وبعض مقاييس الكرش فى الأبقار الفريزيان الحلابة

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أجري هذا البحث بهدف دراسة مقارنة تغذية أبقار الفريزيان الحلابة بإستخدام سيلاج الأذرة بالكيزان أو البرسيم الأخضر أو كلاهما معاً بالإضافة إلى مخلوط العلف المركز مع قش الأرز على معاملات الهضم ، المأكول ، بعض قياسات الدم وبعض مقاييس الكرش.

التجربة عبارة عن ثلاث مجموعات أبقار فريزيان تحتوى كل مجموعه على أربع أبقار حلابه فى المواسم من الثاني إلى الرابع وبمتوسط وزن (٤٩٠ – ٥٦٠ كجم) وتم إجراء تجارب الهضم بعد حوالى ثلاثة أشهر من بداية التجربة بطريقة مستخلص الرماد غير الذائب فى الحامض (acid insoluble ash, AIA) وتم التغذية على العلائق التاليه:-

١- ٤٠% مخلوط العلف المركز + ٣٢% قش أرز + ٢٨% سيلاج أذرة بالكيزان (عليقة المقارنة).

٢- ٤٠% مخلوط العلف المركز + ٣٢% قش أرز +٢٨% برسيم أخضر (عليقة مختبرة أولى).

٣- ٤٠% مخلوط العلف المركز + ٣٢% قش أرز +١٤% سيلاج أذرة بالكيزان +١٤% برسيم أخضر (عليقة مختبرة ثانية).

وكانت أهم النتائج المتحصل عليها كما يلى:

١- معاملات هضم المادة العضوية (OM) خلال فترة التجربه إزدادت معنويا على مستوى (٠,٠٥) عند التغذية على المجموعة الثالثة (برسيم + سيلاج) مقارنة بالمجموعة الثانية (البرسيم) بينما لم يكن هناك فروق معنوية عند مقارنتها بمجموعة الكنترول (سيلاج) ، أيضا تحسنت معاملات هضم الكربوهيدرات الذائبة (NFE) معنويا على مستوى (٠,٠٥) عند التغذية على المجموعة الثالثة (برسيم + سيلاج) مقارنة بالمجموعة الثانية (البرسيم) أو مجموعة الكنترول (سيلاج).

٢- القيم الغذائية ممثلة فى المواد الكلية المهضومة (TDN) ، الطاقة الممثلة (ME) ، الطاقة الصافية (NE) والقيمة الغذائية النسبية (RFV) إزدادت معنويا على مستوى (٠,٠٥) عند التغذية على مجموعة الكنترول (سيلاج) و المجموعة الثالثة (برسيم + سيلاج) مقارنة بالمجموعة الثانية (البرسيم).

٣- إنخفضت قيم الحموضة (pH) لسائل الكرش معنويا على مستوى (٠,٠٥) عند التغذية على مجموعة الكنترول (سيلاج) مقارنة بالمجموعة الثانية (البرسيم) بينما لم يكن هناك فروق معنوية عند مقارنة مجموعة الكنترول (سيلاج) بالمجموعة الثالثة (برسيم + سيلاج) أو مقارنة المجموعة الثالثة (برسيم + سيلاج) بالمجموعة الثانية (البرسيم) ، أما بالنسبة لأمونيا سائل الكرش (NH3) أوالأحماض الدهنية الطيارة الكلية (VFA's) فلم يكن هناك فروق معنوية عند التغذية على العلائق التجريبية.

٤- لا يوجد فروق معنوية على مستوى (٠,٠٥) عند التغذية على مختلف العلائق فى أعداد بكتريا الكرش من السلالتين محل الدراسة (البكتريا المحللة للألياف أو البكتريا المخمرة للنشا) ، ولكنه عند التغذية على المجموعة الثالثة (برسيم + سيلاج) أو مجموعة الكنترول (سيلاج) كانت أعداد سلالة البكتريا المحللة للألياف فى الكرش أعلى مقارنة بالمجموعة الثانية (البرسيم).

٥- كان هناك تأثيرات معنوية على مستوى (٠,٠٥) مع بعض قياسات سيرم الدم مثل تركيزات اللبتين والأنسولين والأحماض الدهنية الحرة والجليسريدات الثلاثية حيث إرتفعت عند التغذية على المجموعة الثانية (البرسيم) بالمقارنة بمجموعة الكنترول (سيلاج) أو المجموعة الثالثة (برسيم + سيلاج) وكذلك إرتفعت مع المجموعة الثالثة (برسيم + سيلاج) بالمقارنة بمجموعة الكنترول (سيلاج) ، أما بالنسبة لتركيزات الأحماض الدهنية غير المرتبطة بروابط إستر (NEFA) و اليوريا فكانت مرتفعة عند التغذية على المجموعة الثانية (البرسيم) بالمقارنة بمجموعة الكنترول (سيلاج) ولم يكن هناك فروق معنوية عند مقارنة مجموعة الكنترول (سيلاج) بالمجموعة الثالثة (برسيم + سيلاج) أو مقارنة المجموعة الثالثة (برسيم + سيلاج) بالمجموعة الثانية (البرسيم) ، وعلى الجانب الآخر فلم يكن هناك فروق معنوية بالنسبة لتركيزات الجلوكوز والكوليسترول والبروتين الكلى عند التغذية على العلائق التجريبية.

يُعتبر التغذية على مخاليط سيلاج الأذرة بالكيزان مع البرسيم مصدراً هاماً لتوفير الألياف والنشا الهامين للنشاط الميكروبى والبروتين ذو القيمة الإقتصادية العالية فى علائق المجترات وهذا يظهر جليا عند دراسة معاملات الهضم والقيم الغذائية وبعض مقاييس الكرش والدم فى المجموعات التجريبية السابقة.

لذا يستنتج من هذه الدراسة أن التغذية على سيلاج الأذرة مع البرسيم يعمل على تحسين الكفاءة الهضمية والغذائية وتوفير الظروف البيئية المناسبة للنشاط الميكروبى بالكرش الأمر الذى يؤدى إلى زيادة الإنتاج ورفع الكفاءة الإقتصادية.