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Impact of Green Fodder Replacement with Corn Silage on Performance and Metabolizability in Growing Hariana Cattle

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ABSTRACT

This study was conducted to determine the effect of green fodder replacement with corn silage on feed intake, growth performance and feed utilization efficiency in growing Hariana cattle. Corn silage was prepared in bunker silo and after ensiling for 60 days, silage was evaluated for nutrients content and physical and chemical characteristics. Low pH value, ammonia-nitrogen (NH_3-N) and butyric acid content and high lactic acid, individual volatile fatty acids (VFAs), total VFAs content and buffering capacity (BC) denoted that prepared corn silage was well preserved and of very good quality. To study the effect of green fodder replacement with corn silage on animal performance, 18 growing Hariana heifers were randomly allocated into three groups (n=6) on body weight (130±3.0 kg) and age basis (14±1.5 months). Experimental heifers either received a basal total mixed ration (TMR) devoid of corn silage ($S_{0\%}$) or were fed on TMR of which 50% ($S_{50\%}$) and 100% ($S_{100\%}$) green fodder were replaced (DM basis) with corn silage. As the level of inclusion of corn silage increased, dry matter intake (DMI) also increased significantly ($P<0.05$) while average daily gain (ADG) was similar among all groups. Residual metabolizable feed consumption (RMFC) measured as the difference between metabolizable energy (ME) intake (MEI) and ME required (MER) showed a linear increase with silage levels. However, residual intake and body weight gain (RIG) showed an inverse trend than RMFC. Other studied feed efficiency measures showed a non-significant effect of treatment. The apparent digestibility of crude protein (CP) was higher in the $S_{0\%}$ group while digestibility of the other nutrients was similar among the three groups. In conclusion, the replacement of green fodder with corn silage reduced metabolizability and increased feed intake without altering growth performance in growing Hariana cattle.

Key words: Blood metabolites, Cattle, Corn silage, Efficiency, Green fodder, Performance

INTRODUCTION

The feed itself accounts for 60 to 65% of the total cost of production in dairy cattle and is the main determinant of production system profitability. Shrinkage of irrigated lands for fodder production, higher labor cost, and small landholdings further increases the cost of rearing dairy animals. Out of the available dry matter, most of it is available in the form of agricultural by-products and dried grass which is of inferior quality. This indicates that as most of the livestock are underfed, they are not able to perform optimally. It is imperative to arrange sufficient good quality feed and fodder for efficient utilization of the genetic potential of the various livestock species and sustainable improvement in productivity. The only way to meet the increasing fodder needs of livestock is to look for alternative options of fodder. Among these, silage is one of them. Availability of nutritious fodder throughout the year can be maintained by converting green fodder into silage.

Silage or grass pickle is the green succulent roughage preserved under controlled anaerobic fermentation in the absence of oxygen by compacting green chops in air and watertight receptacles. Silage is green succulent roughage preserved more or less in its original condition, with a minimum deterioration and minimum loss in respect of various nutritive constituents of fodders. Well-fermented silage is readily consumed by animals and may improve their health and production characteristics (Varadyova *et al.*, 2010). Recent findings on silage production indicate that it could replace conventional fodder without any

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ill-effect on intake, efficiency, digestibility, and performance of dairy animals (Chaudhary *et al.,* 2014). In a well-managed system, where losses are low, the silage dry matter content, digestibility and ME content will be similar or slightly lower and crude protein content might be similar to parent fodder (Kaiser and Piltz, 2004). Preference for cereal green fodder including maize, sorghum, pearl millet, *etc.* is due to more sugar content than protein, as sugar is utilized in the fermentation process to make lactic acid by microorganisms (Nazli *et al.,* 2019).

The biological basis that contributes to the variation in metabolizability of diet includes, feed intake, composition of ration, digestion of feed and associated energy use, activity and metabolism (Nguyen *et al.,* 2005). Approximately one-third of the variation can be explained by known processes and the remaining 67% of the variation is believed to be caused by processes in the body including but not limited to protein turnover, ion pumping and protein leakage (Richardson and Herd, 2004). Feed efficiency tended to be correlated with apparent digestibility of nutrients especially DM and protein, indicating that animals with higher efficiency had higher nutrients digestibility compared to less efficient animals. Therefore, evaluation of the association between the efficiency of feed utilization, and blood variables permits the constant identification of efficient and productive animals (Nkrumah *et al.,* 2007).

A major factor that affects the efficiency of animals is dietary composition. Therefore, a corollary to this concept exists in the utilization of diets, suggesting that when different diets are fed to cattle, the analyses of efficiency measures should be able to differentiate between the efficiencies of the utilization of diet. Considering the significance of feed efficiency measures and limitation of green fodder availability, the present study was designed to investigate the effect of replacement of green fodder with corn silage on feed intake, growth performance and feed utilization efficiency.

MATERIALS AND METHODS

To prepare the best quality silage, maize fodder was used in this study. Fodder harvest was performed at a height of 5 cm above the ground when the moisture content of maize fodder was in the range of 70-75%. Silage was prepared in a bunker silo having a dimension of 20 m×10 m. The whole fodder was chopped into 2-3 cm pieces by using tractor operated forage chopper (Ensiladeria JF40Max, NB Maquinas Ltd., Brazil). Chopped material was filled in the silo and compressed with a tractor fitted with a labeler. For adequate compaction and perfect anaerobic condition, the chopped fodder was covered with two layers of polythene sheets (0.2 mm thickness) followed by a layer of sand and tires. After 60 d of ensiling, the silo was opened from one end and the silage sample was collected in a zip lock polythene pack from the core area of the opened portion of the filled bunker silo. Collected silage samples were used for the evaluation of nutrients content, and physical and chemical characteristics.

The representative samples of silage were analyzed for moisture content by using the toluene distillation method (Method 925.04; AOAC, 1990). Crude protein (CP ; Method 4.2.08), ether extract (EE; Method 920.85) and acid insoluble ash (AIA; Method 923.03) contents were analyzed by following protocols of AOAC (2005). Neutral detergent fibre (NDF), acid detergent fibre (ADF) and acid detergent lignin (ADL) were determined as per the method of Van Soest *et al.* (1991). Ca and P content were determined by titration method (Talpatra *et al.,* 1940) and spectrophotometric method (AOAC, 2005), respectively. The total carbohydrate and non-fiber carbohydrate (NFC) content in silage samples was determined by using the equation of Sniffen *et al.* (1992) and Detmann and Valadares Filho (2010), respectively. Physical characteristics like the smell, colour, structure, *etc.* of prepared corn silage were evaluated by following the guidelines of Horiguchi and Takahashi (2007). The temperatures of the core, lateral and apical parts of the working face of silage were measured by mercury in a glass clinical thermometer (Qingdao Dacon Trading Co. Ltd., Shandong, China). The pH in the silage extract before stabilizing with 5% meta-phosphoric acid was measured by using a pH meter (Systronics pH System-361, India). The estimation of lactic acid in silage samples was done as per the method of Barker and Summerson (1941) and modified by Barnett (1951). Acetic, propionic, butyric, valeric and isovaleric acid was determined with gas chromatography-mass spectroscopy (5975C VL MSD with Triple-Axis Detector, Agilent Technologies India Pvt. Ltd, with 30 m×320 ìm×0.25 ìm capillary column, condition: column temperature 130ºC, injection temperature 220ºC) with flame ionization detector (FID). NH_3-N and total-N were measured in the extract by phenol-hypochlorite assay (Weatherburn 1967) and Method 4.2.08 of AOAC (2005), respectively. BC was determined by the hydrochloric acid-sodium hydroxide method of Playne and McDonald (1966). The concentration of WSC in silage samples was determined by method of McDonald and Henderson (1964). To assess the quality of the silage, the V-Score (Takahashi *et al.,* 2005) and Flieg index (Kilic, 1986) were also calculated.

Animal care procedures were approved (approval number, 121/IAEC/18) and conducted under the established standard of the Institutional Animal Ethics

Table 1. Ingredients and nutrients composition of TMR fed during feeding trial (g/kg DM basis or as mentioned)

Attribute	Group[α]		
	S0%	S50%	S100%
Ingredients composition			
Berseem fodder	400	200	0
Corn silage	0	200	400
Wheat straw	200	200	200
Mustard oil cake, solvent extracted	128	128	128
Ground barley grain	104	104	104
Gram chuni	80	80	80
Wheat bran	80	80	80
Micronutrient mixture[β]	8	8	8
Nutrients composition			
DM	598.9	622.7	646.5
CP	167.4	147.0	126.6
EE	31.7	30.4	29.2
Ash	88.7	78.8	68.9
NDF	467.6	475.9	484.2
ADF	252.6	259.4	266.2
ADL	44.2	44.0	43.7
Total CHO	712.2	743.8	775.3
NFC	244.6	267.9	291.1
Ca	11.1	11.3	11.5
P	4.4	7.4	10.3
ME, Mcal/kg DM	2.24	2.25	2.26

[α]S0%, TMR without corn silage; S50%, TMR of which 50% green fodder was replaced with corn silage and S100%, TMR of which 100% green fodder was replaced with corn silage; [β]Micronutrient mixture consisted (kg-1) of 700,000 IU of vitamin A, 70,000 IU of vitamin D3, 250 mg of vitamin E, 190 g of Ca, 90 g of P, 50 g of Na, 19 g of Mg, 1.2 g of Cu, 9.6 g of Zn, 1.5 g of Fe, 6.0 g of Mn, 325 mg of I, 150 mg of Co, 10 mg of Se.

Committee (IAEC), constituted as per article number 13 of the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) rules laid down by the Government of India. A total of 24 growing Sahiwal heifers were selected from the cattle herd maintained at LFC, DUVASU, Mathura. All heifers were housed in a well-ventilated shed having the proper arrangement for individual feeding and watering without having access to the other animal's diet. Deworming of all the experimental animals was done before the start of the experiment by oral administration of Fentas bolus (Intas Pharmaceuticals Pvt. Ltd., India) at the dose level of 10 mg/kg body weight. Animals were let loose every fortnightly for exercise. Selected heifers were randomly assigned into three groups (n=6) on body weight (130±3.0 kg) and age basis (14±1.5 months). Heifers were either fed on basal TMR consisted of compounded concentrate: green fodder: wheat straw in the proportion of 40: 40: 20 ($S_{0\%}$) or TMR of which 50% green fodder (DM basis) was replaced with corn silage ($S_{50\%}$) and TMR of which 100% green fodder (DM basis) was replaced with corn silage ($S_{100\%}$). Ingredients and nutrients composition of TMR fed in different groups are presented in Table 1. TMR was prepared daily by hand mixing and offered at 0900 h. The calves were fed the TMR in such an amount that at least 5% refusals were left daily per animal. Fresh drinking water was offered *ad libitum* twice daily at 0800 h and 1700 h. A digestion trial with 4 days adaptation and 6 days collection period was conducted at the end of the study. TMR offered and refusal left were sampled daily for chemical analysis. Feces excreted during 24 h were collected and measured daily for 6 days.

The experimental calves were monitored daily for DMI and fortnightly for growth performance and feed efficiency measures. To increase the accuracy of estimation of ADG, calves were weighed at fortnightly intervals in the early morning (0600 h) before offering feed and water. RMFC was used to determine metabolizability by using the following methodology and guidelines of Fan *et al.* (1995) and NRC (1996).

$$\text{RMFC} = \text{MEI} - \text{MER}$$

MEI and MER were calculated as per equations derived by Sharma *et al.* (2016).

$$\text{MEI observed (Mcal/d)} = \text{DMI} \times \text{ME of feed}$$

$$\text{MER (Mcal/d)} = \text{MERm} + \text{MERg}$$

$$\text{MERm (Mcal/d)} = 122 \times \text{BW}^{0.75}/1000$$

$$\text{MERg (Mcal/d)} = (4.1 + 0.0332 \times \text{W} - 0.000009 \times \text{W}^2) / (1 - 0.1475 \times \text{WG})$$

Where, W is the live weight (kg) and WG is the live weight gain (kg/d).

Gross feed efficiency (GFE), net feed efficiency (NFE), energy balance (EB), energy conversion efficiency (ECE), residual body weight gain (RWG), residual intake and body weight gain (RIG), FCR and FCE were used as feed efficiency measures. GFE and NFE were calculated as per guidelines of Okine *et al.* (2001) however; ECE and EB were calculated by following guidelines of NRC (2001).

The representative samples of TMR offered, ort left and feces excreted were dried in a hot air oven at 60°C till a constant weight was attained and ground in a Wiley mill to pass a 1-mm sieve. Processed samples were pooled animal wise and stored at the dry place for chemical analysis. The representative samples of TMR offered and residue left and feces were analyzed for nutrients composition (AOAC, 2005) and fibre fraction (Van Soest *et al.,* 1991).

Data of the study were subjected to analysis of variance using the General Linear Model (GLM) procedure of the Statistical Software Package (SPSS for windows, V21.0; Inc., Chicago, IL, USA). The effect of green fodder replacement with corn silage on performance and feed efficiency measures were tested using the following model:

$$Yijk = \mu + Ti + Dj + (T \times D)ij + eijk$$

Where; $Yijk$ is the dependent variable, ì is the overall mean of the population, Ti is the mean effect of the treatment, Dj is the mean effect of day of sampling (j=0, 30, 60 and 90 days of dietary treatment), $(T\times D)ij$ is the effect of the interaction between treatment and period and $eijk$ is the unexplained residual element assumed to be independent and normally distributed. Individual animals were used as the experimental unit for all data. The pair-wise comparison of means was carried out using "Tukey's honest significant difference (HSD) test". Significance was determined at $P<0.05$ and the values are presented in the tables. Error bars in figures depict standard error. The data were also analyzed for correlation coefficient (r) and coefficient of variation (CV).

RESULTS AND DISCUSSION

In the present study, corn silage was well preserved as indicated by their high lactic acid content and low pH value, NH_3-N content and butyric acid content (Table 2). Ensilaged maize fodder retained its physical characteristics and silage smelled slightly acidic and fruity, appeared brownish-yellow with loose and soft and non-viscous texture. The core silage temperature in the bunker was 32ºC which was slightly higher than the ambient temperature. Flieg points calculated by means of the pH values and DM content also denoted a very good quality of prepared corn silage. The prepared corn silage was well preserved and of very good quality. The DM content and values of other nutritive constituents were within ranges reported previously by NRC (2001) for typical corn silage. The corn silage prepared in the present study had a DM concentration of 270 g/kg fresh silage which was near the optimum stage of maturity at harvest as reported by Phipps *et al.* (2000), Keady *et al.* (2002b) and Keady *et al.* (2007). Fisher and Lessard (1987) reported that the DM, CP and ADF contents were 32.5, 8.0 and 27.0% for corn silage which was in accordance with the findings of the present study. The CP recorded from the silage is well above the threshold of 60 g/kg required by rumen microbes to build their body protein. Below this threshold, intake of fodder by ruminants and rumen microbial activity would be adversely affected (Van Soest, 1994). The pH of silage is one of the simplest and quickest ways of evaluating its quality, as silage properly fermented will have a much lower pH. Kung and Stoke (2001) also reported pH values in the range from 3.7- 4.2 for maize silage. Similar results were obtained by Church (1991), Etman *et al.* (1994), McDonald *et al.* (1995), Sheperd and Kung (1996), and they reported pH values for maize silage ranging around

Table 2. Nutrient composition, physical and chemical characteristics of corn silage (g/kg DM or as mentioned)

Attribute	Amount/characteristics
Nutrient composition	
DM	270
OM	958
CP	83
EE	31
Ash	42
NDF	461
ADF	285
ADL	27
Total CHO	844
NFC	383
Ca	1.50
P	1.90
ME, Mcal/kg DM	2.33
Physical characteristics	
Aroma	Slightly acidic and fruity smell
Colour	Brownish-yellow
Structure/texture	Loose and soft, non-viscous/firm
Temperature, ºC	32
Moldiness	Absent
Chemical characteristics	
pH value	4.37
Lactic acid, g/100g DM	67.35
Acetic acid, g/kg DM	24.18
Propionic acid, g/kg DM	3.69
Butyric acid, g/kg DM	0.29
Valeric acid, g/kg DM	0.18
Isovaleric acid, g/kg DM	0.25
Total acids, g/kg DM	95.94
Lactic: acetic acid ratio	2.79
Total-N g/100g DM	1.52
NH_3-N g/100 g DM	0.13
BC, ml of alkali required	8.94
WSC, g/100 g DM	6.50
V- score	94.57
Flieg index	84.20
Quality classification	Very good

4.2-4.5. Lactic acid is the most abundant acid and imparts around 75% of the total acids contained in silage. In high-quality corn silage, it ranged between 4-7% (Seglar, 2003). The lactic acid content of the present study was within the range and resulted in an optimum pH. Langston *et al.,* (1958) stated that high-quality silage is characterized by low NH_3-N concentration. The NH_3-N content of the corn silage in the present study fell within the range between 0.04 and 0.15% of DM (Sheperd and Kung, 1996). V-score and Flieg index are methods for evaluating the quality of silages. Silage is considered to be very good when it's Flieg index ranges between 81 and 100 (Moselhy *et al.,* 2015). Mafakher *et al.* (2010) studied the chemical composition and quality characteristics of corn, sunflower, and corn-sunflower mixture silages and found the highest Flieg index (103.01) and the best pH value (3.66) for corn silage compared to other silages.

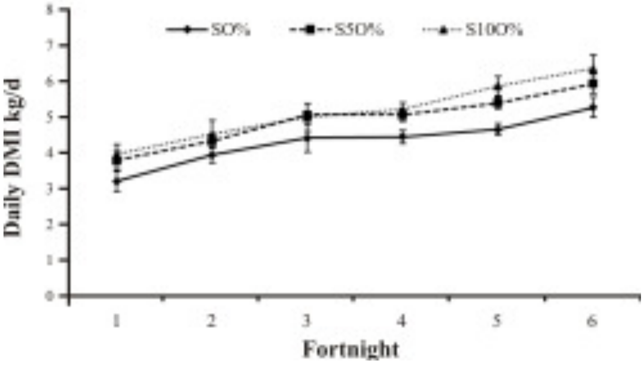

Fig. 1. Effect of green fodder replacement with corn silage on DMI

Effect of green fodder replacement with corn silage on DMI, ADG, feed efficiency measures and

Table 3. Performance, feed efficiency and nutrient digestibility of animals fed TMR containing different levels of corn silage

Attribute	Group			SEM	P value	r	CV[β]
	S0%	S50%	S100%				
Animal performance and feed efficiency							
DMI, kg/d	4.33[a]	4.93[ab]	5.16[b]	0.16	0.032	0.217	0.298
ADG, g/d	618.52	620.74	633.33	19.50	0.950	0.048	0.344
MEI, Mcal/d	9.95[a]	10.96[b]	11.66[b]	1.25	0.032	0.243	0.284
MER, Mcal/d	9.82	9.86	9.92	0.80	0.933	0.024	0.206
RMFC, kg/d	0.13[a]	1.10[b]	1.74[c]	0.53	0.047	0.480	0.386
GFE, Mcal/kg BW	0.054	0.052	0.052	0.004	0.440	-0.070	0.285
NFE, Mcal/kg BW	0.153	0.280	0.218	0.061	0.057	0.146	0.218
RWG, kg/d	-0.09	-0.08	-0.09	0.03	-0.020	-0.811	0.346
RIG index	-0.22[c]	-1.17[b]	-1.84[a]	1.29	-0.838	-0.459	0.395
FCR	7.02	7.99	8.19	0.58	0.510	0.144	0.369
FCE	0.144	0.126	0.124	0.011	0.161	-0.144	0.370
EB, Mcal	279.78	307.76	326.41	21.46	0.088	0.356	0.112
ECE	0.035	0.036	0.036	0.003	0.951	0.034	0.223
Apparent nutrient digestibility, %							
DM	64.53	65.79	64.50	1.04	0.276	-0.004	0.033
OM	68.69	69.95	69.11	0.91	0.291	0.080	0.028
CP	74.10[b]	71.04[b]	65.63[a]	0.90	0.048	-0.884	0.021
EE	77.62	78.62	78.12	0.65	0.299	0.133	0.017
NDF	58.43	60.10	58.80	1.21	0.285	0.053	0.043
ADF	54.89	53.10	54.78	1.37	0.217	0.056	0.049

SEM, standard error of mean, Mean with different superscript in a row differs significantly ($P<0.05$), [¥]Greater ($r>0$) or lower ($r<0$) than zero value of Pearson square correlation coefficient shows positive or negative correlation between RFI and attributes whereas, zero ($r = 0$) value of Pearson square correlation coefficient shows no correlation among RFI and attributes, [β]Coefficient of variation.

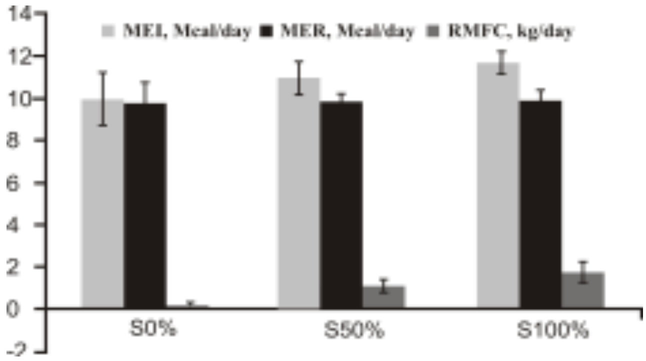

Fig. 2. Effect of green fodder replacement with corn silage on metabolizability

nutrients digestibility are depicted in Table 3. Statistical analysis of data revealed that the replacement of green fodder with corn silage affected daily DMI significantly (P<0.05) and intake was reported to be highest in the $S_{100\%}$ group (Figure 1). However, the replacement of green fodder with different levels of corn silage did not exert any effect on ADG. Although the DMI increased with an increased level of inclusion of corn silage but ADG was similar among all three groups. It is perhaps predictable that the substitution of green fodder by maize silage would cause a positive effect on voluntary forage intake without altering cattle performance due to their high palatability. There are several examples in the literature where maize silage inclusion has stimulated higher voluntary forage intake (Hameleers, 1998), although that was generally accompanied by little or no effect on the performance of dairy animals. Keady *et al.* (2007) offered grass silage either as the sole forage or in addition to maize silage in continental cross beef steers and found that the inclusion of corn silage in the diet increased DM intakes. The corn silage intake was higher than cattle fed with fresh Napier grass (Siddque *et al.,* 2015) and Napier grass silage (Bureenok *et al.,* 2012). Juniper *et al.* (2005) replaced different levels of grass silage with corn silage in the basal diet of Simmental × Holstein-Friesian steers and found that the forage DM intake increased linearly with the increased level of inclusion of maize silage. The linear increase in intake response to forage substitution observed in the current experiment corroborate well with earlier reports in dairy cows (O'Mara *et al.,* 1998; Phipps *et al.,* 2000). El-Ayouty *et al.,* (2000) also found that up to 100 % of maize silage or berseem silage can be fed to rabbits without affecting the growth performance. Fazaeli *et al.,* (2006) also observed the non-significant effect of the inclusion of different levels of corn and sorghum silage on body weight gain of yearling male calves. Thus, the results suggest that corn silage has the potential to replace green fodder in diets fed to growing cattle.

MEI was increased with an increased level of corn silage while MER was similar among all three groups. RMFC measured as the difference between ME intake and ME required showed significant (P<0.05) effect of replacement of green fodder with corn silage. As the level of replacement of green fodder with corn silage increased RMFC increased. Heifers in group $S_{50\%}$ and $S_{100\%}$ consumed 0.97 and 1.61 kg more DM/day than the $S_{0\%}$ group yet gaining at a similar rate (Figure 2). Replacement of green fodder with corn silage did not affect RWG, GFE, NFE, FCR, and FCE. However, feed efficiency measure like RIG index showed significantly (P<0.05) higher value in the $S_{0\%}$ group followed by $S_{50\%}$ and $S_{100\%}$ groups. Lower RMFC and higher RIG index in $S_{0\%}$ group are favorable and showed better metabolizability in green fodder fed animals. As inclusion levels of corn silage increased, EB also increased due to increased DMI but showed a non-significant effect. ECE also showed a non-significant effect of treatment.

Although the mean digestibility of CP was significantly (P<0.05) higher in $S_{0\%}$ and $S_{50\%}$ compared to $S_{100\%}$ groups but mean apparent digestibility of other nutrients was similar among all groups. RMFC, NFE, EB, ECE and FCR showed positive whereas; GFE, RWG, RIG, and FCE showed a negative correlation with treatment. Replacement of green fodder with corn silage showed a positive correlation with OM, EE, NDF, and ADF digestibility coefficient whereas; negative correlation with DM and CP digestibility coefficient.

Several feed efficiency measures calculated as a function of individual intake and body weight gain have been proposed over the years in an attempt to quantify the capacity of animals to convert the ingested feed into a product. Heifers fed on green fodder based TMR showed better metabolizability of TMR than corn silage fed groups. Ideally, ME intake should equal ME required and RMFC should be nearly zero on a population basis (Fan *et al.,* 1996). Okine *et al.,* (2001) observed similar ME requirement between steers fed silage and silage-grain based diets. However, they reported an 8% higher ME intake for steers fed alfalfa compared to fenugreek silage. Accordingly, other studies also reported that animals with less metabolizability consumed more feed and had a less efficiency of feed utilization than animals with high metabolizability (Smith *et al.,* 2010; Kelly *et al.,* 2011a; Sobrinho *et al.,* 2011). The relative differences in the heifers with lower RMFC when fed berseem fodder compared to the higher RMFC when fed silage based diet could also indicate that green fodder may cause heifers to be more efficient in converting feed to gain. It appears from the analysis of RMFC that heifers were more efficient in converting feed to gain and maybe less wasteful when fed green fodder compared to corn silage based diet.

The digestibility varies between individuals and is affected by physiological state, physical and chemical characteristics of the diet, intake, and feed availability (Titgemeyer, 1997). Compared to fresh forage, the digestibility of silages is lower (Neto *et al.* 2009). The mean digestibility of CP was significantly ($P<0.05$) higher in $S_{0\%}$ and $S_{50\%}$ compared to $S_{100\%}$ groups, however; mean apparent digestibility of other nutrients was similar among three different groups. High CP content in TMR of S0% group than $S_{50\%}$ and $S_{100\%}$ groups might be the reason behind higher CP digestibility. Mahmoud and Ebeid (2014) offered one of the three rations with different kinds of forage berseem, berseem plus corn silage or corn silage to multiparous Egyptian buffaloes. They found significantly higher digestibility coefficients of DM, CP, CF, and cellulose in a berseem fed group compare to other tested rations. However, no significant differences were noticed among tested rations for OM, EE, NFE, NDF, ADF, and hemi-celluloses. These results are in agreement with those obtained by El-Aidy (2003) and Khalafalla *et al.* (2007) who found higher digestibility of nutrients for cows or buffaloes fed rations containing berseem fodder. In general, the higher digestibility values obtained for CP in the S_0 group may be attributed to the effect of feeding such high quality forage which provided stimulatory factors to cellulolytic and other rumen bacteria (Das and Singh, 1999).

CONCLUSIONS

In the present study, nutritional, physical and chemical attributes denoted that prepared corn silage was of very good quality and well preserved. Green fodder replacement with 50 and 100% of corn silage increased feed intake and reduced metabolizability while growth performance was similar. The metabolizability of diet was reduced with an increased level of corn silage yet the performance of growing cattle was similar. So, corn silage can be used as an alternative to high quality green fodder.

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