

Influence of Ruminally Protected Fat and Urea Treated Corncobs Ensiled with or without Corn Steep Liquor on Nutrient Intake, Digestibility, Milk Yield and Its Composition in Nili-Ravi Buffaloes

M. Sarwar*, M. Ajmal Khan and Mahr-un-Nisa

Department of Animal Nutrition, University of Agriculture, Faisalabad, Pakistan

ABSTRACT : Sixteen early lactating Nili-Ravi buffaloes, four animals in each group, were used in a Completely Randomized Design to evaluate the effect of varying levels of both ruminally protected fat and urea treated corncobs ensiled with or without corn steep liquor (CSL) on feed intake, digestibility and milk production and its composition. Four experimental diets were formulated. The control (C) diet was balanced to contain 0% fat and 35% urea treated corncobs ensiled with 0% CSL. The low fat (LF), medium fat (MF) and high fat (HF) diets had 45, 55 and 65% urea treated corncobs ensiled with 9% CSL and 2, 4 and 6% ruminally protected fat, respectively. Dry matter, crude protein (CP) and neutral detergent fiber (NDF) intakes by buffaloes remained similar across all treatments. However, DM and NDF as a percent of body weight and digestible DM intakes were higher in HF diet when compared to C, LF and MF diets. Digestible NDF intakes were also significantly higher in HF diet as compared to all other diets. The intakes of ADF and digestible ADF were higher in MF and HF than C and LF diets. The significant variation in digestible DM, ADF and NDF intakes may be attributed to the ammoniation of corncobs along with CSL that caused significant changes in the degradability and digestibility of the diets. Ether extract and digestible EE intakes differed significantly ($p < 0.05$) among all treatments. Intakes of EE were the highest in animals fed HF diet, which was because of added fat. Apparent DM digestibility was the highest in animals C diet and was the lowest in those fed LF diet. Neutral detergent fiber and ADF digestibilities were higher in animals fed diets containing urea treated corncobs ensiled with 9% CSL when compared to those fed diets containing urea treated corncobs ensiled without CSL. Apparent digestibility of CP was noted highest (71.47%) in animals fed HF diet when compared to those fed MF (67.75%), LF (67.04%) and C (65.39%) diets. Milk yield (4% FCM) was the higher in buffaloes fed HF, MF and LF diets than those fed C diet. These results indicated that increasing levels both of fat and urea treated corncobs ensiled with CSL elevated the negative effects of poor quality fibrous feed on milk production by buffaloes. (*Asian-Aust. J. Anim. Sci. 2004, Vol 17, No. 1 : 86-93*)

Key Words : Urea, Corn Steep Liquor, Ruminally Protected Fat, Corncobs, Buffaloes

INTRODUCTION

Ruminants fed largely on crop residues, are deficient in nutrients and total energy intake. This low energy intake appeared primarily due to insufficient ruminal fermentable nitrogen (N) or protein deficiency in the diet (Sarwar et al., 1994). The availability of energy from crop residues is limited due to excessive lignification, poor digestibility and palatability. The nutrient imbalance or deficiency in crop residues was the primary constraint impeding ruminant production as it adversely affects fertility, growth, and milk production.

These straws can successfully be used as feed for dairy animals provided their nutritional worth is improved (Sarwar et al., 1994). One of the feasible methods may be to chemically upgrade the feeding value of straws, as the chemical treatment has the potential to increase the feed intake and nutrient digestibility by the ruminant animals. Various chemicals like sodium hydroxide (Sarwar et al., 1992), urea (Sarwar et al., 1994), ammonia (Williams et al., 1984) and alkaline hydrogen peroxide (Lewis et al., 1987)

have been used for upgrading these poor quality cereal straws. Among the various chemicals employed for the treatment of cereal straws, ammonia, an alkali, has shown good results, but ammoniation of straw using gaseous or aqueous ammonia have their inherent problem of being costly and tedious to transport.

Urea, a cheap source of ammonia after hydrolysis, has given satisfactory results as far as the improvement in nutritive value of corncobs is concerned (Ali et al., 1993). However, its use as a source of ammonia is not perfect method because the ammonia liberated from urea as a result of action of ureolytic organism is not fully fixed in the straw. The urea treated corncobs only retained about 30-35% of ammonia added to the straw during treatment and the remaining 65-70% was lost to the atmosphere (Saadullah et al., 1981). This escaped ammonia is not only a significant nitrogen (N) loss but it also causes atmospheric pollution. Thus it is imperative to devise some method, which can help save or minimize this major loss of ammonia to the atmosphere.

To overcome the problem of ammonia loss during straw ammoniation process, some researchers have tried to fix the excess ammonia in the straw by spraying some organic acids (like formic acids and acetic acid) or inorganic acids

* Corresponding Author: M. Sarwar. E-mail: sarwar041@hotmail.com

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Table 1. Chemical composition of urea treated comcobs ensiled with or without CSL

Items (%)	Treatments ¹	
	Control	CSL 9
CP	6.44	13.56
NDF	76.01	82.93
ADF	53.69	52.94
ADL	7	6.43
ASH	1.7	1.68

¹Control and CSL 9 treatments contain 5% urea treated comcobs ensiled with 0 and 9% CSL, respectively.

Table 2. Ingredients and chemical composition of diets fed to lactating buffaloes

Ingredients	Diets ¹			
	NF	LF	MF	HF
Comcobs	35	45	55	65
Cane molasses	9	9	9	9
Corn bran	10	8	2	1
Canola meal	20	15	21	7
Maize oil cake	17	14	2	1
Cotton seed meal	6	3	2	8
Berga fat	0	2	4	6
Mineral mixture	2	2	2	2
Salt	1	1	1	1
Chemical composition, %				
DM	88.97	89.14	90.09	89.97
OM	88.28	88.05	89.15	89.08
CP	14.94	14.90	15.02	15.20
NDF	49.14	52.50	53.16	54.11
ADF	29	32	34	35
ADL	7.88	9.17	10.19	10.85
EE	2.08	4.01	5.98	7.94
NE _L , Mcal/kg	1.41	1.40	1.41	1.40

¹C contained 35% urea treated comcobs ensiled without CSL and 0% ruminally protected fat, while LF, MF and HF contained 45, 55 and 65% urea treated comcobs ensiled with 9% CSL and 2, 4 and 6% of ruminally protected fat, respectively.

(like H₂SO₄ and HCl) with different degree of ammonia fixation (Borhani, et al., 1982). But fixing excess ammonia with acid is costly and hazardous and thus, its use by farmers is impracticable. The corn steep liquor (CSL) may offer a solution to the problem of escaping ammonia and poor fermentation of urea treated comcobs. Because it does not only contain easily soluble carbohydrates, which can improve fermentation, but its acidic pH (3.4) can also help fix the excess ammonia. Thus, the use of this feed ingredient alone can enhance both the fermentation process and ammonia fixation in the ensiled urea treated comcobs.

Fat supplementation in dairy diets potentially increased the energy intake and milk yield in lactating cows (Palmquist, 1990; Firkins and Estridge, 1992). The additional benefit of fat feeding during hot and humid conditions was achieved because of its low specific dynamic effect (Madison et al., 1994). However, the deleterious effects of ruminally active fat in the diets of dairy cattle were depressed milk fat synthesis and decreased

fiber digestibility, suggesting problems in rumen fermentation (Muhamad, 1994). These negative effects of fat feeding had partially overcome by the development of ruminally inert fats (Grummer, 1988). Numerous studies (Pantoja et al., 1994; Pantaja et al., 1996) have evaluated the effects of different combinations of forage and inert fat on nutrient digestibility, milk production and composition in dairy cows. However, the scientific evidence regarding its effect when fed in combination with varying levels urea treated comcobs ensiled with or without CSL is limited. Therefore, the main objectives of the present project were to determine the effect of varying levels of ruminally protected fat and urea plus CSL treated comcobs on feed intake, nutrient digestibility and milk production in early lactating buffaloes.

MATERIALS AND METHODS

Treatment of comcobs

The urea treatment method used in this experiment was to add 5 kg urea and 50 kg water per 100 kg air-dry comcobs. After the urea was dissolved in the water, the solution was uniformly sprayed on the comcobs. Then the comcobs was put into two different cemented pits and ensiled for a period of 5 days with air temperatures of 35-45°C. In the control pit, the comcobs were treated with 5% urea only. In the second pit, 9% CSL on dry matter basis was added to the 5% urea treated comcobs. Each pit was covered with 4 inches thick layer of rice straw, followed by plastic film covering which was plastered with a blend of comcobs and mud to avoid any cracking on drying. The pits were allowed to react for 5 days, it was assumed that plastic film, and mud plastering provided anaerobic conditions for proper silage making. When the feed was used, the plastic film was removed and the feed withdrawn starting with the upper layer and working downwards to the lower layers. An amount of the fermented straw was taken out just sufficient for one day's feeding after being taken from the pit and the plastic film was put back to keep the pit sealed. The samples of this fermented comcobs was analyzed for dry matter (DM), organic matter (OM), nitrogen (N) and ash by the methods of AOAC (1990), neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) by methods described by Van Soest et al. (1991). Chemical composition of urea treated comcobs ensiled with or without CSL is given in Table 1.

Animals and diets

Sixteen early lactating Nili-Ravi buffaloes, four animals in each group, were used in a Completely Randomized Design to evaluate the effect of varying levels of ruminally protected fat and 5% urea treated comcobs ensiled with or without CSL on feed intake, digestibility and milk

Table 3. Fiber intake and its digestion by buffaloes fed diets containing urea treated corncobs with or without com steep liquor (CSL) and ruminally-protected fat

Items	Treatments ¹				SE
	NF	LF	MF	HF	
NDF intake, (kg/day)	5.38	5.72	5.75	5.85	0.17
Fecal NDF, (Kg/day)	2.75 ^a	2.69 ^a	2.56 ^a	2.22 ^b	0.05
Apparent NDF digestibility	48.88 ^d	52.97 ^c	55.47 ^b	62.02 ^a	0.21
ADF intake, (kg/day)	3.18	3.49	3.68	3.78	0.09
NDFI, %BW	1.25 ^b	1.16 ^{bc}	1.70 ^c	1.31 ^a	0.02
Fecal ADF, (kg/day)	1.72 ^a	1.71 ^a	1.89 ^a	1.53 ^b	0.04
Apparent ADF digestibility	45.91 ^d	46.39 ^c	51.00 ^b	59.53 ^a	0.3
Digestible nutrient intake (kg/day)					
NDF	2.63 ^a	3.02 ^a	3.19 ^a	3.63 ^b	0.04
ADF	1.46 ^a	1.62 ^b	1.88 ^c	2.25 ^d	0.04

¹ C contained 35% urea treated corncobs ensiled without CSL and 0% ruminally protected fat, while LF, MF and HF contained 45, 55 and 65% urea treated corncobs ensiled with 9% CSL and 2, 4 and 6% of ruminally protected fat, respectively.

production and its composition. Animals were housed on a concrete floor in separate pens. Buffaloes averaged 30±5 days in lactation. Four experimental diets were formulated (Table 2). Corncobs ensiled with urea and urea plus 9% CSL was the roughage used in the experimental diets. The control (C) diet was balanced to contain 35% urea treated corncobs ensiled with 0% CSL and 0% ruminally protected fat and low fat (LF), medium fat (MF) and high fat (HF) diets were formulated to have 45, 55 and 65% urea treated corncobs ensiled with 9% CSL, and 2, 4 and 6% ruminally protected fat, respectively. All diets were formulated to be iso-nitrogenous and iso-energetic using NRC (1988) values for energy and protein. Diets were mixed daily and fed twice a day at *ad libitum* intakes.

The buffaloes were fed for 40 days. The first 10 days were allowed for dietary adaptation and 30 days were for sample collection. Daily feed intake and milk production were averaged over 30 days. Milk samples (a.m. and p.m.) were collected twice weekly during the last 30 days of feeding trial and were analyzed for crude protein (CP), fat, solid not fat, total solids and ash by the methods described by AOAC (1990). During the last week of the trial, a digestibility trial was conducted. The acid insoluble ash was used as digestibility marker (Van Keulen and Young, 1977). Fecal grab samples were taken twice daily such that a sample was obtained for every 3 h interval of 24 h period (8 samples) between am and pm feedings (Sarwar et al., 1991). Feed offered andorts were sampled daily and composted by animal for analysis. Diets, orsts and fecal samples were analyzed for DM, OM and CP (AOAC, 1990) for NDF (Van Soest, 1991), ADF and ADL (Goering and Van Soest, 1970) for estimation of NE_L (Conrad et al., 1984).

Statistical analysis

The data collected on different parameters (feed intake, milk production, milk composition and digestibility of DM, OM, NDF, ADF, CP and EE) were analyzed according to Completely Randomized Design. The difference in means

was tested using Duncan's Multiple Range test (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

Intake

Daily dry matter intakes (DMI) by buffaloes fed C, LF, MF and HF diets were 10.96, 10.90, 10.82 and 10.81 kg, respectively, and this was statistically non-significant across all treatments. However, DMI as a percentage of body weight showed a curvilinear relationship. Dry matter intake, as a percentage of body weight was higher in animals fed C and HF diets than those fed LF and MF diets and similar trend was noticed in digestible DMI. However, the difference among mean values was non-significant. The lack of difference in DMI in this study can be ascribed to both the enhanced fiber digestibility of corncobs because of ammoniation and addition of ruminally inert fat that not only remained largely unavailable in the rumen because of its low solubility and high melting point (Canale et al., 1990) but it could not also impair ruminal fiber digestibility that possibly affects the distension of rumen that can limit the DMI. Schaff and Clark (1990) also noted a lack of effect of ruminally inert fat on DMI when added up to 7.2% of the ration DM. Canale et al. (1990) reported similar effects of supplemental fat on DMI. Grant and Weinder (1992) suggested that adequate fiber was necessary to feed fat successfully but what does constitute adequate intake of effective fiber is yet to be determined. Ohajuruka et al. (1991) also noticed no effect of supplemental fat in high forage diets on DMI as a percentage of body weight. Allen (2000) reported that physical regulation of DMI occurred when feed intake was limited by the time required for chewing or by distension within gastro intestinal tract. Such effects of fiber on gut fill were not noticed in this study. The improved DMI may be attributed to enhanced digestibility of NDF (Table 4). Waldo (1986) suggested that NDF content was the best single chemical predictor of DMI by

Table 4. Dry matter (DM), crude protein (CP) and ether extract (EE) intakes and their digestion by buffaloes fed diets containing urea treated corncoobs¹ with or without corn steep liquor (CSL) and ruminally protected fat

Items	Treatments ¹				SE
	NF	LF	MF	HF	
Dry matter intake, (kg/day)	10.96	10.90	10.82	10.81	0.52
Faecal DM, (kg/day)	3.21 ^c	4.18 ^a	3.96 ^b	3.79 ^b	0.09
Apparent DM digestibility	70.71 ^a	61.65 ^d	63.40 ^c	64.93 ^b	0.34
DMI, %BW	2.89 ^a	2.26 ^b	2.19 ^b	2.59 ^a	0.06
CP intake, kg/day	1.64	1.62	1.63	1.64	0.04
Faecal CP, kg/day	0.550 ^a	0.540 ^a	0.542 ^a	0.460 ^b	0.02
Apparent CP digestibility	66.46 ^d	66.664 ^c	66.75 ^b	71.95 ^a	0.19
EE intake, (kg/day)	0.227 ^d	0.468 ^c	0.647 ^b	0.858 ^a	0.02
Faecal EE, (kg/day)	0.04 ^b	0.081 ^a	0.119 ^d	0.151 ^c	0.01
Apparent EE digestibility	82.37	82.69	81.60	82.40	0.35
Digestible nutrient intake (kg/day)					
DM	7.74	6.78	6.85	7.01	0.9
CP	1.09	1.08	1.09	1.17	0.02
EE	0.18 ^a	0.39 ^b	0.53 ^c	0.71 ^d	0.01

¹C contained 35% urea treated corncoobs ensiled without CSL and 0% ruminally protected fat, while LF, MF and HF contained 45, 55 and 65% urea treated corncoobs ensiled with 9% CSL and 2, 4 and 6% of ruminally protected fat, respectively.

ruminants. In present study, NDF intakes remained unchanged across all treatments and the lack of difference was noted because all diets had approximately similar NDF concentration. Sarwar et al. (1992) concluded that DMI was positively correlated with dietary NDF concentration when energy limited intake but negatively when ruminal fill limited intake. In the present study HF diet contained the highest forage NDF and inert fat, so improved DMI response with this particular diet may be the compensation of energy deficit imposed by increased concentration of DM and NDF from corncoobs.

Reidelberger (1994) suggested that unsaturated long chain fatty acids reaching the small intestine reduced the gastrointestinal motility and thus DMI. Fat stimulated cholecystokinin (CCK) release, which not only contributed to satiety (Reidelberger, 1994) but also suppressed feed intake by inhibiting gastric emptying (Moran and McHugh, 1982). Reidelberger (1994) reported that the peripheral action of gut CCK in fat added diet inhibited the gastric emptying and increased distension activation of vagal or splanchnic afferent neurons that inhibited the brain satiety center or increased absorption of nutrients by stimulation of pancreatic enzyme secretion and gallbladder contraction, which stimulated hepatic satiety mechanism. However, the findings of the present study may not be explained by that the rate of oxidation of fatty acids in the liver alters signals generated by hepatic vagal afferent nerves to brain centers signaling satiety (Reidelberger, 1994) Effects of beta-oxidation of fatty acids on signal generated by hepatic vagal afferent nerves might be directly from generation of reducing equivalents or generation of ATP and its effect on ATP dependent sodium pump.

Crude protein intake remained unaltered across all treatments. Similar trend was noted in the intake of

digestible CP, which supported the finding of Misra et al. (2000). However, it was reported previously that excessive dietary N as non-protein nitrogen resulted in depressed intake with related increase in ruminal NH₃ and plasma urea (Knox and Steel, 1999). However, this factor should not be considered important to explain the differences among experimental diets regarding the intake of different feed fractions because CP intake remained similar for all treatments (Table 4). However, the nature and fraction of CP ingested varied among treatments that might have affected the ruminal NH₃ concentration, fermentation and ultimately the feed intake as previously indicated by Wankhade and Kalbande (2001). Sanchez et al. (1998) suggested that insufficient metabolizable protein was generally responsible for the depression in DMI commonly observed with supplemental fat. However, metabolizable protein may not be the problem in the present study.

Ether extract (EE) and digestible EE intakes significantly differed among all treatments when compared to those fed MF, LF and C diets. This difference may be attributed to the variation in proportion of fat that was added into different diets. Muhammad (1994) reported similar results previously when inert fat was fed to lactating cows.

Dry matter digestibility

Apparent DM digestibility was significantly different among all diets (Table 4). It was the highest in animals fed control diet when compared to those fed LF, MF and HF diets. However, diets supplemented with increasing fat level showed a linear increase in their apparent DM digestibility. However, Muhammad (1994) reported the lack of effect of inert fat supplementation on DM digestibility of high and medium forage diets, however, small difference in apparent

Table 5. Milk yield and composition by buffaloes fed diets containing urea treated corncobs with or without com steep liquor (CSL) and ruminally-protected fat

Items	Treatments ¹				SE
	NF	LF	MF	HF	
Milk yield, 4% FCM, kg/day	12.94	13.21	13.10	13.19	1.38
Milk fat, %	7.07	7.08	6.97	7.11	0.30
Solids not fat, %	9.28	9.50	9.06	9.05	0.10
Total solids, %	16.25	16.44	15.85	15.37	0.31
Crude protein, %	3.49 ^b	3.55 ^b	3.88 ^a	3.95 ^a	0.06
True protein, %	2.99	3.05	3.09	3.19	0.06
Non protein nitrogen, %	0.50	0.50	0.79	0.76	0.09

¹C contained 35% urea treated corncobs ensiled without CSL and 0% ruminally protected fat, while LF, MF and HF contained 45, 55 and 65% urea treated corncobs ensiled with 9% CSL and 2, 4 and 6% of ruminally protected fat, respectively.

DM digestibility that although statistically significant among LF and MF diets may be attributed to supplementation of highly digestible fat.

Fiber digestibility

The NDF digestibility was the lowest (48.88%) in animals fed C diet and was the highest (62.02%) in animals fed HF diets (Table 4) and was significantly different across all diets. This increased linearly both with the increasing level of NDF from ammoniated corncobs and fat. Similar pattern was noticed for ADF digestibility. The increased NDF digestibility with increasing level of ruminally inert fat may be attributed to the reduced concentrates in these diets (Chalupa et al., 1986). Chalupa et al. (1984). Muhammad (1994) reported that ruminally inert fat remained largely unavailable in the rumen because of its low solubility, high saturation or high melting point and so they less likely to be absorbed by bacteria. Therefore, detrimental effects on ruminal fermentation from adding these inert fats were minimized (Hill and West, 1990). Grummer (1988) also reported that addition of ruminally-protected fat in dairy diets did not affect NDF digestibility. Feeding ruminal-protected fat up to 7.2% of ration DM did not adversely affect rumen pH and VFA production (Palmquist et al., 1989). The improved NDF digestibility may also be explained by increased intake of more digestible NDF source as previously reported by Sarwar et al. (1992). The higher degradability rate of urea treated corncobs ensiled with 9% CSL than that ensiled without CSL may be a reason for its increased fiber digestibility (Mahr-un-Nisa et al., 2002). This indicated that some delignification occurred during ensiling of straw that consequently improved digestibility. They further reported that negative relationship between degree of lignification and cell wall digestion in forage was well recognized. Sarwar et al. (1994) concluded that improved digestibility of ammonia treated corncobs might be the result of ammonolysis of galacturonic acid esters attached to xylan chains of hemicellulose. Ammonia may spongify ester bonds between lignin and hemicellulose and saturates H-bonds linking the matrix polysaccharides. Furthermore, it

has been reported that ammoniation of straw might have reduced the concentrations of p-coumaric and ferulic acids that are well recognized to cause depression in fiber digestibility of straw (Burit et al., 1984). The reduced NDF and ADF digestibility of C diet may be attributed to high levels of rapidly fermentable carbohydrate in the form of molasses and wheat bran (Table 4) that might have inhibited the fibrolytic bacteria and thus, reduced the NDF digestibility. Similar findings were previously reported by Mehra et al. (2001). The present results may also be explained by the fact that decreasing percentage of NDF from forage in C diet might caused the reduction in ruminal pH as previously documented by (Sarwar et al., 1992) which might have inhibited the activity of cellulolytic microbes.

Crude protein digestibility

The buffaloes fed HF diet had the highest (71.95%) apparent CP digestibility whereas it was the lowest (66.46%) in animals fed C diet and was significantly different across all diets (Table 3). These results achieved the expected increased N fixation in the matrix of cell wall fiber following ammoniation with CSL might have resulted into slow release of N in the rumen. This slow release ruminal N perhaps maximized N synchronization with carbon skeleton and thus minimized the N loss. It may be hypothesized that the urea treated corncobs ensiled with CSL might have provided sufficient digestible fiber for the proper rumen fermentation. This might have caused a rapid drop in ruminal pH because of increased production of VFA (Dass et al., 2000). This reduced ruminal pH has probably changed free ammonia (NH₃) into ionic form of ammonia (NH₄⁺) and reduced its absorption through the ruminal wall and thus improved its ruminal utilization efficiency. This notion may also be supported by the ruminal NH₃, VFA concentrations and microbial count in other study (Mahr-un-Nisa et al., 2002). One important factor that possibly be considered important to explain present findings was increased level of ruminally escaped protein, that might have improved CP digestibility, in HF diet when compared to all other diets in the experiment.

Milk production and composition

The average daily milk (4%FCM) produced by cows fed C, LF, MF and HF diets was 12.94, 13.21, 13.10 and 13.19 kg, respectively (Table 5). The statistical analyses revealed that milk yield was different across all diets. The results of this study were consistent with the findings of Osteigaard et al. (1981) who reported that the largest increases in production were obtained by feeding ruminally inert fat to lactating cows at different stages of lactation. Depeters and Cant (1992) suggested that supplementation of dairy rations with more than 2% added fat often improved milk yield. Sarwar et al. (1991) reported increased milk yield in cows fed diets supplemented with Ca salts of fatty acid. This high milk yield was because of the improved NE_L intake by cows. However, Depeters et al. (1990) reported contrasting results but the fat percentage response was similar with our study. Grummer and Carrol (1991) concluded that beneficial effect might be due the improvement in energy balance. However, level of milk production, stage of lactation and energy balance of lactating animals were considered important factors that moderated any response to dietary fat (West and Hill, 1990).

In the present study, HF and MF diets had higher amount both ruminally undegradable protein and inert fat which might have provided a better nutrient synchronization at cellular level and thus helped to synthesize more milk. The other plausible explanation of this increased milk yield could be that buffaloes fed HF and MF diets ate increased digestible NDF (Sarwar et al., 1991).

Percent CP in milk was significantly different across all diets (Table 5). The milk CP was noted highest (3.95%) in buffaloes fed HF diet and 3.88, 3.55 and 3.49 percent in animals fed MF, LF and C diets. Present results may be explained by the fact that the addition of inert fat might have reduced the usage of amino acids as fuel and thus spared them for casein synthesis. However, improvement in CP concentrations in milk of buffaloes fed HF and MF diets may be attributed to increase by pass protein supplied by these diets. This may be supported by a metabolic trail (Mahr-un-Nisa et al., 2002) where total bacterial counts, per ml viable and cellulolytic count were noted higher in animal fed diets containing urea treated corncobs ensiled with CSL. Similar results were reported by Kanjanaputhipong and Leng (1998). The improved synchronization of nutrients both at ruminal and cellular levels and thus improved utilization of N from CSL plus urea treated corncobs for milk protein synthesis may also be supported by the highest milk CP as a percentage of total CP intake in buffaloes fed HF and MF diets. Palmquist and Moser (1981) suggested that dietary fat might improve amino acid transport to the mammary gland and milk protein synthesis by inducing insulin resistance. However, Grummer (1988) found no depression in percentage of milk protein when prilled fat

was added to basal diets of lactating cow. However, present results were contrary to those previously reported by Tacket et al. (1996) who reported that increasing energy density by adding fat reduced the protein concentration of milk. The decrease in milk protein because of high fat intake may be mediated through a decrease in amount of blood flow per unit milk volume, which might have resulted in a change in the delivery of amino acids, glucose, acetate and long chain fatty acids to mammary glands (Tacket et al., 1996).

True protein and NPN fractions as a percentage of milk protein did not show any treatment effect. Present findings were contrary to those reported by Sarwar et al. (1991) who concluded that cows fed diets decreasing in non structural carbohydrates and increasing in added fat often depressed milk protein percentage with out altering protein yield, partly because of changes in post absorptive metabolism. Milk fat, solid not fat and total solid were remained unaltered across all treatments. These results were consistent with the findings of Man and Wiktorsen (2001). However, others workers (Grummer and Carrol, 1991) noted increased percentage of milk fat in animal fed ruminally inert fat.

CONCLUSION

Present results indicated that increasing levels both of fat and urea treated corncobs ensiled with CSL elevated the negative effects of poor quality fibrous feed on milk production by buffaloes. Milk production was higher when buffaloes were fed diet containing 65% urea treated corncobs ensiled with CSL and 6% inert fat.

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