EFFECT OF SUPPLEMENTING UREA MOLASSES MINERAL BLOCK LICK TO STRAW BASED DIET ON DM INTAKE AND NUTRIENT UTILIZATION

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Summary

Twelve male crossbred calves of 18 months of age were divided into two groups of six each. Animals in both the groups were fed wheat straw *ad lib.* However, animals in group II had free access to urea molasses mineral block (UMMB) lick.

Straw DM intake (kg/100 kg B. Wt. and g/$w^{0.75}$ kg) was significantly ($p < 0.01$) higher in group II (1.95 ± 0.06; 75.55 ± 1.79) as compared to group I (1.27 ± 0.08; 48.77 ± 2.43). Straw DM digestibility coefficient was not significantly different in groups I and II. However, DOMI (kg/100 kg B. Wt.) was significantly ($p < 0.01$) higher in group II (0.986 ± 0.05) as compared to group I (0.615 ± 0.03). Digestibility coefficient of DM, OM and CP were significantly higher in group II as compared to group I. However, digestibility coefficients of EE, CF and NFE were non-significantly different between the two groups. Animals in group II exhibited significantly ($p < 0.01$) higher and positive N, Ca and P balances as compared to group I which exhibited negative balances. Total-N, ammonia-N and urea-N in the blood plasma of animals in group II were significantly ($p < 0.01$) higher as compared to group I.

(**Key Words** :Urea Molasses Mineral Block, Digestibility Coefficients, Total-N, Ammonia-N, Urea-N)

Introduction

One of the methods of increasing the utilization of straws is the supplementation of deficient nutrients in the form of fermentable N, energy and minerals ensuring thereby enhanced microbial growth in the rumen which in turn enables the ruminant to consume more straw. Several workers have shown the increase in intake and/or digestibility of straws when supplemented with urea, molasses and minerals (Pathak and Ranjhan, 1976 and Daniel et al., 1986a,b) the technology was not extensively adopted by the farmers due to certain constraints in its application. To overcome this problem, the National Dairy Development Board, Anand, India, undertook to develop UMMB lick which is safe for ruminant feeding besides providing a continuous source of fermentable N, energy and minerals (Kunju, 1986). Thus, UMMB lick was fed to crossbred calves to study its effect on straw intake and nutrient utilization.

Materials and Methods

Twelve male crossbred (Sahiwal × H. F.) calves of 18 to 24 months of age were divided into two groups of six each. Animals in both the groups were fed on wheat straw *ad lib.*, while the animals in group II were supplemented with UMMB lick free choice. The UMMB lick was placed in a specially designed trough and kept in the adjoining but separate manger to facilitate free access of both wheat straw and UMMB lick.

After a preliminary feeding of forty days, a seven days metabolic trial was conducted. Daily feed intake and UMMB consumption was recorded. Daily dung and urine oupput was measured. Samples of wheat straw, UMMB lick and dung were analysed for the chemical content as described in AOAC (1975).

Calcium and phosphorus contents in feed, dung and urine were estimated according to the method of Talpatra et al. (1940) and AOAC (1975) respectively.

Total-N and ammonia-N in blood plasma were estimated by Kjeldhal and Conway (1962) methods respectively. Blood plasma urea was determined by the method of Skeggs (1957).

The data collected were analysed statistically according to Snedecor and Cochran (1967) using

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Student's t-test.

Results

Effect of UMMB lick supplementation on straw intake and digestibility of nutrients

The proximate composition of UMMB lick supplemented to animals in group II is shown in table 1. As shown in table 2, straw intake (kg/100 kg body wt. and g/$w^{0.75}$ kg) increased significantly ($p < 0.01$) in group II (1.95 ± 0.06 ; 75.55 ± 1.79) when compared to group I (1.27 ± 0.08; 48.77 ± 2.43). Straw DM digestibility coefficient was not significantly different in groups I (48.54 ± 1.06) and II (48.65 ± 1.20). In contrast, the digestible organic matter intake (DOMI) of straw (kg/100 B. wt.) was significantly ($p < 0.01$) higher in group II (0.986 ± 0.05) as compared to group I (0.619 ± 0.03). The digestibility coefficients of various nutrients in the two groups are shown in table 3. The digestibility coefficients of DM and OM were significantly ($p < 0.05$) higher in group II (53.37 ± 1.05; 53.85 ± 1.39) as compared to group I (48.54 ± 1.06; 48.98 ± 1.21). CP digestibility coefficient was nil, may be due to higher metabolic fecal N than intake,

TABLE 1. INGREDIENT COMPOSITION AND CHEMICAL COMPOSITION OF UMMB

Ingredient	Percent	Particular	% DM basis
Molasses	15	Nitrogen	9.41
Urea	45	Ether extract	0.61
Salt	8	Crude fibre	1.80
Mineral mixture	15	Total ash	37.56
Sodium bentonite	3	Nitrogen free extract	51.62
Calcite powder	4	Calcium	6.60
Cotton seed extraction	10	Phosphorus	2.30

TABLE 2. ACCOUNT OF DAILY STRAW AND UMMB INTAKE AND STRAW DM DIGESTIBILITY COEFFICIENT IN TWO GROUPS

Group	Body weight (kg)	UMMB intake (kg)	Straw intake**		Straw DM digestibility coefficient	DOMI** through straw (kg/100 kg B. Wt.)
			kg/100 kg B. Wt.	g/$w^{0.75}$ (kg)		
I	224.0 ±14.2	– –	1.27 ±0.08	48.77 ±2.43	48.54 ±1.06	0.619 ±0.03
II	228.4 ±12.4	0.445 ±0.04	1.95 ±0.06	75.55 ±1.79	48.65 ±1.20	0.986 ±0.05

** $p < 0.01$

TABLE 3. DIGESTIBILITY COEFFICIENT OF VARIOUS NUTRIENTS IN TWO GROUPS

Group	DM*	OM*	CP**	EE	CF	NFE
I	48.54 ±1.06	48.98 ±1.21	– –	48.91 ±1.56	42.96 ±0.94	62.54 ±1.80
II	53.35 ±1.05	53.85 ±1.39	50.30 ±1.62	49.22 ±0.82	43.28 ±0.71	64.15 ±2.61

* $p < 0.05$; ** $p < 0.01$.

in group I whereas, it was 50.30 ± 1.62 in group II. The digestibility coeffiecients of EE, CF and NFE were not significantly different between groups I (48.91 ± 1.56; 42.96 ± 0.94; 62.54 ± 1.80) and II (49.22 ± 0.82; 43.28 ± 0.71; 64.15 ± 2.61).

Effect of UMMB lick supplementation to wheat straw based diet on N, Ca and P balances

The results of N, Ca and P balances in two different groups are shown in table 4. N intake (g/day) was significantly ($p < 0.01$) higher in group II (73.73 ± 3.71) as compared to group I (19.55 ± 0.78). Similarly, N excreted in feces and urine and balance (g) were significantly ($p < 0.01$) higher in group II (36.92 ± 2.91; 33.92 ± 0.08; 2.90 ± 1.07) as compared to group I (26.27 ± 1.23; 21.25 ± 0.06; −27.97 ± 0.61). Ca intake (g/day) was significantly ($p < 0.01$) higher in group II (51.96 ± 2.57) as compared to group I (14.25 ± 0.57). Daily Ca excreted in feces and urine and balance (g) were also significantly ($p < 0.01$) higher in group II (42.33 ± 1.51; 6.58 ± 0.64; 2.85 ± 0.74) as compared to group I (18.65 ± 0.65; 1.97 ± 0.07; −6.37 ± 4.80). Similarly, P intake (g/day) was significantly ($p < 0.01$) higher in group II (14.67 ± 0.85) as compared to group I (2.79 ± 0.11). Like N and Ca, daily P excreted in feces and urine as well as balance (g) were also significantly ($p < 0.01$) higher in group II (12.49 ± 0.85; 1.68 ± 0.16; 0.50 ± 0.11) as compared to group I (3.17 ± 0.10; 1.01 ± 0.07; −1.39 ± 0.12).

Effect of supplementing UMMB lick on nitrogen fractions in blood plasma

Total N (g/100 ml) in blood plasma was significantly ($p < 0.01$) higher in group II (2.165 ± 0.02) as compared to group I (1.822 ± 0.02). Similarly, blood plasma NH_3-N and urea-N (mg/100 ml) levels were significantly ($p < 0.01$) higher in group II (1.27 ± 0.04; 17.56 ± 0.36) as compared to group I (0.29 ± 0.03; 4.29 ± 0.21; table 5).

TABLE 4. DAILY N, Ca AND P BALANCES (g) IN TWO GROUPS

Particular	Group I	Group II
	NITROGEN	
Intake**	19.55 ± 0.78	73.73 ± 3.71
Excreted in feces**	26.27 ± 1.23	36.92 ± 2.91
Excreted in urine**	21.25 ± 0.06	33.92 ± 0.08
Balance**	−27.97 ± 0.61	2.90 ± 1.07
	CALCIUM	
Intake**	14.25 ± 0.57	51.96 ± 2.57
Excreted in feces**	18.65 ± 0.65	42.53 ± 1.51
Excreted in urine**	1.97 ± 0.07	6.58 ± 0.64
Balance**	− 6.37 ± 4.80	2.85 ± 0.74
	PHOSPHORUS	
Intake**	2.79 ± 0.11	14.67 ± 0.85
Excreted in feces**	3.17 ± 0.10	12.49 ± 0.65
Excreted in urine**	1.01 ± 0.07	1.68 ± 0.16
Balance**	− 1.39 ± 0.12	0.50 ± 0.11

** $p < 0.01$.

Discussion

High CP content (58.51%) in UMMB lick was obviously due to the addition of urea at the rate of 15 percent. Total ash (37.56%) content was also high due to the addition of mineral mixture (15%), sodium bentonite (3%), calcite powder (4%) and salt (8%) in UMMB lick.

Cereal straws are deficient in nitrogen, energy and minerals and can not support maintenance

TABLE 5. DIFFERENT N CONSTITUENTS IN BLOOD PLASMA IN TWO GROUPS

Group	Total N** (g/100 ml)	NH_3-N** (mg/100 ml)	Urea-N** (mg/100 ml)
I	1.822 ±0.02	0.29 ±0.03	4.29 ±0.21
II	2.165 ±0.02	1.27 ±0.04	17.56 ±0.36

* $p < 0.01$

or production unless supplemented with deficient nutrients required for microbial growth in the rumen as well as by the animal (Preston and Leng, 1984). Due to these deficiencies, intake by the animals on feeding wheat straw alone was low and increased significantly on supplementation with UMMB lick which forms an economical source of fermentable nitrogen and energy through urea and molasses, respectively. Campling et al. (1962) have reported that when urea was infused continuously in the rumen of cattle (150 g/day), straw intake (kg/day) increased from 5.6 to 7.9. Obviously, supplementation of adequate nitrogen, energy and minerals accelerate rumen fermentation which was reflected in the fermentation of higher amounts of straw resulting in increased amount of straw consumption. It appears that such supplementations speed up the rate of fermentation of straws due to increased microbial activity in the rumen through increased microbial proliferation but this did not alter the extent of fermentation in terms of unit amount of ingested straw as a result of which the DM digestibility of the wheat straw remained similar in both the groups. Since the animals ingested more dry matter from straw due to increased fermentation on supplementation of UMMB lick, the DOMI was higher in group II as compared to that observed when the animals were fed straw alone. Several other workers have also reproted an increase in DM intake on supplementation with UMMB lick (Beams, 1963; Leng, 1984; Neric et al., 1985; Leng and Brumby, 1985; Fouly and Leng, 1986; Kunju, 1986; Sudana and Leng, 1986; Soetanto et al., 1987a,b and Tiwairi et al., 1988). However, Schiere et al. (1987) observed neither an increase in intake nor digestibility of rice straw on supplementation with UMMB lick.

Besides nitrogen and energy, straws are deficient in minerals as well and thus when the animals were solely fed on such straws, they exhibited negative balances of N, Ca and P. On supplementation with UMMB lick which provided N to animals through urea and Ca and P through mineral mixture and calcite powder (Ca only), the animals exhibited positive balances of those elements. Improvement in N balance has also been reported by other workers on supplementation with UMMB lick (Coombe and Mulholland, 1983; Sudana and Leng, 1986 and Mirza et al., 1988). Tiwari et al. (1988) reported significantly ($p < 0.01$) higher N, Ca and P balances when wheat straw was supplemented with UMMB lick.

Different N fractions in blood plasma were higher due to supplementation of UMMB lick. It has been reported that blood urea N levels indicate adequacy or the inadequacy of nitrogen in the diet of animals (Hammon, 1983; Oltner and Wiktorsson, 1983 and Jindal et al., 1988). In other words, if urea N levels in blood are too low, these clearly indicate that the feed was deficient in nitrogen. In the present study, blood urea N level was too low (4.29 mg/100 ml) in animals fed only wheat straw whereas, it was optimum (17.56 ± 0.36) on supplementation with UMMB lick. It indicated that straws are evidently deficient in nitrogen but on supplementation with UMMB lick, this deficiency was overcome. A number of workers reported an increase in blood urea N levels of the animals when fed urea/ammonia treated straws or DCP was replaced by urea in the ration (Herrera Saldana, 1982; Reddy, 1981; Bruckental et al., 1986 and Singh and Gupta, 1988).

These studies indicate that supplementation of UMMB lick to straw based diet led to 53 percent higher straw intake and these animals exhibited positive N, Ca and P balances. Thus,

it was possible to maintain animals on straw diets if supplemented with UMMB lick.

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