Indian J. Anim. Nutr. 2021. 38 (2): 213-217
doi: 10.5958/2231-6744.2021.00031.1

Indian Journal of Animal Nutrition

SHORT COMMUNICATION

Nutrient intake, Digestibility and Rumen Fermentation Parameters in Buffalo Bulls fed Cumbu Napier (COBN-5) Fodder

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ABSTRACT

In the present study, Cumbu Napier (COBN-5) fodder was evaluated for nutrient intake, digestibility and rumen fermentation pattern in buffalo bulls. The average DMI (kg/d) of buffalo bulls was 6.01 and met the requirements for maintenance indicating that the fodder is palatable. The pre cent DCP (8.74) and TDN (56.05) in the fodder consumed met the ICAR standards. The DM, DCP, TDN and ME intake per kg $W^{0.75}$ in buffalo bulls fed *ad libitum* of COBN-5 fodder were 73.03, 6.38, 40.93 and 0.15, respectively. The digestibility co-efficients (%) nutrients in COBN-5 fodder were better as compared to many Napier grass varieties. Positive balance of nitrogen, calcium and phosphorus was observed and sole feeding of the fodder met the requirement of these nutrients n buffalo bulls. Rumen pH values were highest at 0 h and declined to minimum by 6 h post feeding, while TVFA reached peak at 6 h post feeding and NH_3-N reached peak at 2 h post feeding. It was concluded that feeding COBN-5 fodder *ad libitum* to buffalo bulls had no adverse effects.

Key words: COBN-5 fodder, Apparent digestibility, Nutrient utilization, Rumen fermentation

The low productivity of dairy animals in India is attributed to inadequate supplies of quality feeds and fodder. Due to ever-increasing human population, arable land is diverted to production of food and cash crops with little chance for fodder production. There may be many ways to overcome the shortage of forage and one among them is the introduction of high yielding forage varieties (Mahr-un-nisa and Sarwar, 1998). This led to the cultivation of perennial fodders with higher biomass per unit area, an immediate solution to meet the current livestock production. Consequently, high yielding forages including a number of varieties of Napier hybrids have been introduced in many parts of the world, including India. Cumbu Napier (COBN-5) fodder was newly developed hybrid Napier variety by Tamil Nadu Agricultural University (TNAU) at Coimbatore and released for commercial cultivation in 2013 (Babu *et al.,* 2014). It is an inter-specific hybrid between fodder Cumbu IP 20594 (*Pennisetum glaucoma*) and Napier grass FD 437 (*Pennisetum purpureum Schumach*). The characteristic features of COBN-5 include robust tillering perennial grass, high biomass potential round the year, high palatability, high leaf to stem ratio *etc.* Green forages generally meet the requirements of maintenance, however nutritive evaluation of a particular fodder is the need of the hour for their optimum utilization in ruminant feeding. Hence, the present study was undertaken to study the nutrient intake, digestibility and rumen fermentation parameters in buffalo bulls fed COBN-5 fodder.

Six Murrah buffalo bulls (5 years; Avg. BW 357.97 ± 43.36 kg), housed in well ventilated conventional sheds maintained in good hygienic condition were used for the present study. The chopped COBN-5 green fodder was procured from the cultivated fields of Live-stock Farm Complex (LFC), NTR College of Veterinary Science, Gannavaram and fed *ad libitum* to the animals for a period of 66 days. The chopped COBN-5 fodder was offered to animals four times during a period of 24 hours. The animals were weighed at the beginning and ending of the metabolism trial. Every time, weighing was done on two consecutive days before offering feed and water and the average body weight was calculated.

On 58th day of the experimental period, the

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buffaloes were shifted to the metabolism stalls for adaptation (2 days) so as to reach their normal feed consumption. This was followed by metabolism trial of 6 day collection period during which daily feed intake, feed refusals if any as well as faces and urine voided were recorded at 9.00 AM. Representative samples of feed offered, feed residue and faeces voided during collection period were collected and pooled for 6 days, dried and ground in a laboratory Wiley mill through 2 mm screen and preserved in air tight bottles for subsequent analysis. The urine voided by each animal was measured, mixed thoroughly and representative sample (2%) was taken in glass bottle for each animal and stored at 4ºC in a refrigerator after addition of few drops of concentrated H_2SO_4. Samples of fodder and faeces were analyzed for proximate constituents and urine for N according to AOAC (2007) methods and forage fibre constituents (Van Soest *et al.,* 1991). Calcium and Phosphorus in fodder and faeces were estimated following methods of Talapatra *et al.* (1940). Ca and P content of urine samples were determined the methods of determined by Ferro and Ham (1957) and Fiske and Subba Row (1925), respectively.

Table 1. Chemical composition (% DM basis) of COBN-5 fodder

Nutrient	Mean ± SE
Dry matter	17.94±1.09
On % dry matter basis	85.64±1.61
Organic matter	
Total ash	14.36±1.61
Crude protein	13.05±0.51
Ether extract	2.82±0.22
Crude fibre	27.09±4.30
Nitrogen free extract	42.67±1.99
Neutral detergent fibre	67.31±3.03
Acid detergent fibre	40.84±2.41
Hemi-cellulose	26.47±0.44
Cellulose	35.07±2.97
Acid detergent lignin	5.73±2.74
Silica	3.41±0.25
Calcium (%)	0.73±0.20
Phosphorus (%)	0.57±0.10

Three adult rumen fistulated Murrah buffalo bulls (380±9.36 kg BW) maintained on COBN-5 fodder were used to determine the rumen pH, ammonia nitrogen (Livingston *et al.,* 1964) and total volatile fatty acids (Barnett and Reid, 1957). Data obtained were analyzed statistically (Snedecor and Cochran, 1994) using SPSS 17.0 version.

The chemical composition and cell wall constituents of COBN-5 fodder are presented in Table 1. The CP content in the COBN-5 (13.02 %) was similar to the values in Napier grass varieties reported by earlier workers (Garg *et al.,* 2012). The NDF content of COBN-5 fodder in the present study is 67.06 per cent. In comparison, Kebede *et al.,* (2016) reported higher values. The ADL content of fodder in the present study is 6.13 per cent which is in agreement with the reports of Budiman *et al.* (2012). However, lower (Singh *et al.,* 2012) values were reported in a previous study as compared to the value of present study. These differences in proximate composition and cell wall constituents observed in the present study with COBN-5 variety as compared to other bajra×napier varieties might be attributed to the differences in breeding, variety of cultivar used, stage of harvest, type of soil, season, cultivation practices *etc.*

Data pertaining to intake digestibility and nutritive values are presented in Table 2. Perusals of data revealed that sole feeding of COBN-5 fodder supplied adequate amount of DCP and TDN to meet the requirements for maintenance as recommended by ICAR (2013). This indicates that COBN-5 fodder is highly palatable. Abdulrazak *et al.* (1996) and Kariuki *et al.* (1998) reported lower DMI for Napier grass as compared to that of COBN-5 fodder indicating that COBN-5 fodder is more palatable as compared to Napier grass.

Calculated ME (Mcal/d) intake by buffalo bulls in the present experiment was 12.18 and is higher than the earlier report (Garg *et al.,* 2012) in animals fed hybrid Napierxbajra fodders. Increased amount of ME Mcal) in COBN-5 fodder may be attributed to easily soluble and degradable fraction of carbohydrates and protein. The DM, DCP, TDN and ME intakes per $kgW^{0.75}$ in

Table 2. Intake and apparent digestibility (%) of nutrients and plane of nutrition in buffalo bulls fed COBN-5 fodder

Parameter	COBN-5
Dry matter intake (kg/d)	6.01±1.11
Intake of nutrient (g/ kg W $^{0.75}$)	
DM	73.03±1.21
DCP	6.38±1.48
TDN	40.93±1.91
ME (Mcal)	0.15±1.32
Apparent Digestibility of nutrients (%)	
Dry matter	60.62±2.17
Organic matter	62.38±2.30
Crude protein	68.74±1.58
Ether extract	62.60±1.30
Crude fibre	55.72±2.64
Nitrogen free extract	62.74±3.56
Neutral detergent fibre	55.07±1.21
Acid detergent fibre	46.18±2.64
Hemi cellulose	71.30±2.62
Cellulose	47.00±2.10
Nutritive value (%)	
DCP	8.74±2.10
TDN	56.05±2.14

buffalo bulls fed *ad libitum* of COBN-5 fodder were higher than the values recommended in ICAR (2013) standards.

Data pertaining to apparent digestibility of nutrients are presented in Table 2. The apparent digestibility of DM, CP, CF, OM and NFE in the present study was higher than the other Napier varieties reported by earlier workers (Reddy *et al.,* 2009; Wadhwa *et al.,* 2010; Chandra *et al.,* 2012). Apparent digestibility of CP for COBN-5 fodder observed in the present study was similar to that observed in bajra variety (PHBF-1) as reported earlier (Singh *et al.,* 2009). The NDF digestibility of COBN-5 fodder as reported in the present study was similar with the findings of Chandra *et al.* (2012) in Napier fodder. Similarly, the ADF digestibility of COBN-5 fodder corroborated with findings of Wadhwa *et al.* (2010) in Napier grass. The digestibility of cellulose and hemi-cellulose for COBN-5 fodder as observed in the present study were antithetical to the values reported in Napier fodder by Reddy *et al.* (2009) and Wadhwa *et al.* (2010).

Data pertaining to nitrogen, calcium and phosphorus utilization in buffalo bulls fed COBN-5 fodder are presented in Table 3. Calcium and phosphorus intake (g/d) was higher in the present experiment when compared to the other Napier varieties. Further, the calcium and phosphorus requirement of buffalo bills for maintenance (Ranjhan, 1998) was met by feeding *ad libitum* COBN-5 fodder as a sole diet.

Data on rumen fermentation pattern in buffalo bulls fed COBN-5 fodder is presented in Table 4. Time of sampling had a significant (P<0.01) effect on pH, ammonia nitrogen and TVFA in strained rumen liquor (SRL) of buffalo bulls fed COBN-5 fodder. The present study revealed that the pH of rumen liquor showed a decreasing trend up to 6 h post feeding in all the buffalo

Table 3. Nutrient utilization in buffalo bulls fed *ad libitum* COBN-5 fodder

Parameter	Nitrogen	Calcium	Phosphorus
Intake, g/d	676.67±11.24	160.00±9.48	148.00±8.12
Outgo, g/d			
Faeces	211.25±22.09	132.10±20.34	104.64±8.22
Urine	63.11±16.78	6.19±0.30	19.20±1.39
Total	274.36±36.73	138.29±20.48	123.84±8.19
Retention			
Retention, g/d	402.31±48.46	21.71±3.96	24.16±14.86
% intake	59.45±1.80	13.57±2.86	16.32±5.74
% absorbed	86.44±1.87	77.81±1.46	55.72±3.81

Table 4. Rumen fermentation parameters in buffalo bulls fed COBN-5 fodder

Parameter	Hours					
	0	2	4	6	8	Mean ± SE
pH	6.52±0.02[d]	6.43±0.01[c]	6.33±0.03[b]	6.21±0.04[a]	6.31±0.03[b]	6.36±0.08
Ammonia Nitrogen (mg/100 ml SRL)	12.50±0.03[b]	16.60±0.03[e]	15.54±0.04[d]	14.00±0.06[c]	12.23±0.05[a]	4.17±1.34
TVFA(meq/L of SRL)	65.75±2.46[a]	78.75±3.01[b]	83.00±2.94[c]	92.50±2.90[e]	87.25±2.59[d]	81.45±7.17

[a,b,c,d,e]values in the rows bearing different superscripts differ significantly; P<0.01

bulls fed COBN-5 fodder and increased thereafter. These findings were in agreement with the values of Srinivas Kumar *et al.* (2011) in buffalo bulls fed Napier fodder. Post prandial decline in pH observed in the present study might be attributed to increased microbial fermentation and accumulation of organic acids in the rumen. The rumen ammonia nitrogen concentration increased linearly up to 2 h post feeding beyond which there was a decline in its concentration. These values are in agreement with the findings of previous workers (Kariuki *et al.,* 2001 in cattle, and Puga *et al.,* 2001 in sheep) fed Napier fodders. The mean TVFA concentration in SRL of buffalo bulls was higher at 6 h of post feeding and lowest was reported at 0 h of feeding, respectively. Similar findings were reported in buffalo bulls fed CO-1 fodder (Srinivas Kumar *et al.,* 2011). However, higher TVFA concentration was reported by Muia *et al.* (2001) in Friesian calves and Puga *et al.* (2001) in sheep than the values in the present study.

CONCLUSION

It was concluded that feeding *ad libitum* COBN-5 fodder to buffalo bulls met the adequacy of nutrients interms of supply of DCP, TDN, Ca and P. Further, feeding COBN-5 fodder as a sole diet to buffalo bulls had no adverse effects nutrient utilization, rumen fermentation pattern and plane of nutrition.

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Received on 14.07.2021 and accepted on 11.08.2021