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Nutrient Intakes and Digestibility in Dairy Calves Fed Congo-Signal (*Brachiaria Ruziziensis)* Based Complete Feed Block in Mizoram.

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ABSTRACT

The study was for assessing the utility of congo-signal (*Brachiaria ruziziensis)* based complete feed block in growing dairy calves of Mizoram. Complete feed blocks were prepared incorporating congo-signal hay and commercial dairy concentrate mixture at 55:45 ratio and fed to 6 uncastracted male calves for 3 weeks followed by a digestibility trial for seven days duration. Nutritional analysis revealed average 10.11±0.19% CP and 62.18±1.02% TDN in congo-signal grass and 17.05±0.18% CP and 67.27±0.60% TDN in complete feed block. The mean DM, protein and energy intakes were recorded as 4.31±0.02 kg/day, 0.86±0.00 kg CP/day and 2.90±0.04 kg TDN/day, respectively which indicated their adequate intakes for the dairy calves [@ 2.5% of live weight]. The digestibility of DM, OM, CF, ADF and NDF were found to be 38.14±2.24%, 39.53±2.46%, 37.84±2.97%, 35.04±3.24% and 31.39±1.45%, respectively. Blood profile indicated adequate intake and efficient utilization of protein by the dairy calves. The study established the usefulness of feeding complete feed block to growing dairy calves instead of traditional mixed grasses-tree fodder-concentrate feeding system for efficient nutrient intakes and utilization in Mizoram.

Key words: Dairy calves, complete feed block, congo-signal, mineral profile, Mizoram.

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INTRODUCTION

Mizoram is one of the eight North Eastern states with the total geographical areas of 21,081 square kilometres and it shares long international boarder (722 km) with Bangladesh to its west and Myanmar to its east. The climate of the state is mild throughout the year. The state receives very high rainfall during summer particularly during May to October every year and average annual rainfall is 254 cm/annum. The state has eight districts and total population is about 0.9 million [1].

Mizoram rural economy is agriculture and livestock based and 70-80% of rural people are engaged, directly or indirectly, with the agriculture and livestock sector. However, for low fertility of soil and geographical constraints, agricultural productivity is very low and the farmers mostly depend on livestock and poultry farming for their livelihood. The dairy animals accounted for 22% of the total value of output from livestock sector in the state. As per Quinquennial livestock census, 2007, the state has 10,744 crossbred cattle, 24,244 indigenous cattle population, whereas buffalo population is 5,000. But, the per capita availability of milk is only 31 gm/day in the state against the national average of 281 gm/day which is for low productivity of the crossbred cattle (7.46 kg/day), indigenous cows (1.56 kg/day) and buffaloes (1.56 kg/day).

Feeding system of dairy cattle in Mizoram is traditional knowledge based low input feeding system where nutritional demands of the animals are met mainly by the crop residues, natural grasses, tree leaves and shrubs [2]. The congo-signal (*Brachiaria ruziziensis)* is one of the abundantly grown and available fodders in Mizoram and is utilized as one of the main green fodders for feeding the dairy animals. One of the various means to improve nutrient intake and utilization from roughage resources is feeding in the form of complete feed block. Considering the importance of congo-signal grass as the roughage source and its acceptability by bovine species, the present study was undertaken for assessment of nutrient intakes and digestibility in dairy calves fed congo-signal based complete feed block, and also certain blood parameters were estimated to correlate with nutrient intakes in growing dairy calves in Mizoram.

MATERIALS AND METHODS

Location of the study and experimental animals

The study was conducted at College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram. Six uncastracted male animals (average body weight 165$\pm$0.23 kg, age 2-3 years) were randomly selected from the Cattle unit of Instruction Livestock Farm Complex, College of Veterinary Sciences and Animal Husbandry, Selesih, Aizawl, Mizoram for the study. The animals were the crosses between H. F. and indigenous cattle.

Collection of congo-signal grass and its preparation for making complete feed block

The congo-signal grasses (*Brachiaria ruziziensis)* were collected from 10 different randomly selected locations in and around the College of Veterinary Sciences and Animal

Husbandry, Selesih, Aizawl, Mizoram. At least 3 representative samples were collected from each location. The collected congo-signal grasses were cut into 3-5 cm length and dried in the sunlight to remove moisture and to make them suitable for complete feed block preparation. The dried cut grasses were incorporated with commercial dairy concentrate mixture in the ratio of 45: 55, mixed thoroughly in an electrically operated horizontal mixer and 3-5 kg weight feed blocks were prepared utilizing the feed block formation machine developed by IARI, New Delhi, India. Molasses was used as the binding material. The complete feed blocks were kept wrapping with polythene sheet in a dry place before feeding to the animals.

Feeding trial

The selected experimental animals were separated and kept individually in the experimental shed for 15 days to accustom with the new environment before starting the feeding experiment. During the adaptation period, the animals were gradually shifted from the normal concentrate-mixed forage based feeding to complete feed block feeding introducing complete feed block @ 25: 75, 50:50, 75:25 and 100% level.

Digestibility trial

After three weeks of experimental feeding of complete feed block, a digestibility trial was conducted for seven days. The animals were fed individually during the digestibility trial. Daily individual intake and amount of faeces voided by the animals were recorded. Blood samples were collected at 1^{st}, 4^{th} and 7^{th} day of the digestibility trial for studying blood profile. Serum were separated and kept at 4^0 C for further analysis.

Analytical methods

The analysis for proximate composition of congo-signal grass, complete feed block and faeces samples was done following standard methods [3]. During faeces collection period, 24 hrs collection was mixed thoroughly and sub-sample of 1.0% of wet weight was utilised for dry matter estimation and sub-sample of 0.5% of wet weight was preserved in 40% (W/V) H_2SO_4 solution for nitrogen estimation. Analysis of total nitrogen was made using kjeldahl method [4]. The percent nitrogen free extract (NFE on dry matter basis) was estimated by subtraction (100% - CP% - CF% - TA% - EE %). The fibre components like NDF, ADF and ADL were estimated according to the standard procedures [5].

The analysis of calcium and phosphorous of congo-signal grass was done following method of Talapatra *et al.* [6], whereas the concentration in blood plasma was estimated using analytical kits of Coral Clinical systems, India. The micro-mineral concentrations were estimated by Atomic Absorption Spectrophotometer (GBC, SensAA). The standards for each element were prepared using the separate stock standards. Total serum protein and blood urea nitrogen were estimated using analytical kits of Coral Clinical systems, India.

The TDN value was calculated as per the following formula on the basis of ADF values.

TDN (%) = 96.35 – (% ADF X 1.15), where ADF is on dry matter basis.

RESULTS AND DISCUSSION

Nutritional composition

The nutritional composition of congo-signal grass (*Brachiaria ruziziensis)* and the complete feed block is depicted in table.1. The DM% of congo-signal grass was found to be 18.46±0.27%, whereas average CP, EE, CF, OM and TDN were estimated as 10.11±0.19%, 1.93±0.04%, 34.28±0.45%, 87.52±0.14% and 62.18±1.02% respectively on DM basis. The average ADF, NDF and ADL were estimated as 29.71±0.89%, 56.11±3.17% and 5.86±0.11% respectively on DM basis. The mean Cu, Zn and Mn level were 3.99±0.03 mg/dl, 3.8±0.56mg/dl and 40.60±0.44 mg/dl, respectively. The Ca and P content were 4.62±1.58% and 2.05±0.35%, respectively in the congo-signal grass. Similar nutritional composition and mineral profile were also reported [7, 8, 9] in congo-signal grass. The complete feed block, where congo-signal grass and concentrate mixture were used in 55:45 ratio, the DM was estimated as 87.29±0.48% with 17.05±0.18% CP and 67.27±0.60% TDN. The CF was 18.97±0.34% and ADF and NDF were estimated as 25.29±0.52% and 41.03±0.17%, respectively. The mean Ca and P in complete feed block were 1.51±0.02% and 2.13±0.08%, respectively, whereas the Cu, Zn and Mn were estimated to be 7.93±0.32 mg/dl, 12.37±0.24 mg/dl and 62.08±0.22 mg/dl, respectively. Both the macro and micro minerals estimated in the congo-signal and complete feed block were found to be above the critical concentration [10] for bovines.

Table.1. Nutritional composition of congo-signal grass (*Brachiaria ruziziensis)* and complete feed block fed to the growing dairy calves (on dry matter basis)

Proximate composition		
Nutrient	**Complete feed block**	**Congo-signal grass**
Dry matter (%)	87.29±0.48	18.46±0.27
Crude protein (%)	17.05±0.18	10.11±0.19
Ether extract (%)	1.88±0.06	1.93±0.04
Crude fibre (%)	18.97±0.34	34.28±0.45
Total ash (%)	14.86±0.22	12.49±0.14
Nitrogen free extract (%)	47.24±0.62	41.19±0.37
Organic matter (%)	85.14±0.22	87.52±0.14
Acid detergent fibre (%)	25.29±0.52	29.71±0.89
TDN# (%)	67.27±0.60	62.18±1.02
Fibre components and mineral profile		
Neutral detergent fibre (%)	41.03±0.17	56.11±3.17
Cellulose* (%)	5.49±0.26	11.30±0.79
Hemi-cellulose** (%)	15.74±0.36	26.40±2.29
Acid detergent lignin (%)	4.94±0.11	5.86±0.11
Calcium (%)	1.51±0.02	4.62±1.58
Phosphorous (%)	2.13±0.08	2.05±0.35
Copper (mg %)	7.93±0.32	3.99±0.03
Zinc (mg %)	12.37±0.24	3.8±0.56
Manganese (mg %)	62.08±0.22	40.60±0.44

* **Cellulose** = ADF – (ADL - Ash)

** **Hemi-cellulose**: NDF – ADF

TDN (%) = 96.35 - (%ADF x 1.15), where ADF is on a dry matter basis

Nutrient intakes and digestibility of Nutrients

The average DM intake (DMI) was found to be 4.31±0.02 kg/day in dairy calves when fed complete feed block incorporating with congo-signal grass (Table.2). Considering the average body weight of 165±0.23 kg, DMI was found to be higher than the requirement [@2.5% of body weight]. Kumar *et al.* [11] also reported 2.46 kg DMI/100 kg body weight in buffalo calves fed complete feed block of wheat straw - paddy straw (1:1) with concentrate at 60:40 ratio. Similarly, Sharma *et al.* [12] reported DMI of 7.15 kg/day in cattle calves fed compressed complete feed of wheat straw (30 parts), groundnut fodder (30 parts) and concentrate mixture (40 parts). Intakes of protein (0.86±0.00 kg CP/day) and energy (2.90±0.04 kg TDN/day) were also found higher than the required levels for growing calves.

The average apparent digestibility of DM, CP, EE, CF and NFE were 38.14±2.24, 49.00±3.10%, 50.25±7.01%, 37.84±2.97 and 35.66±3.88%, respectively. OM digestibility was observed to be less than as reported earlier [7, 9] in ruminant fed congo-signal grass. However, digestibility of DM, CP, EE and CF was found to be higher in the present study than as reported earlier [13] in dairy calves fed concentrate-mixed grass-tree fodder based ration under rural feeding system in Mizoram.

Table.2. Nutrient intakes and apparent nutrient digestibility in growing dairy calves fed complete feed block of congo-signal (*Brachiaria ruziziensis)* as roughage source

Nutrient intakes	
Dry matter (kg/day)	4.31±0.02
Crude protein (kg/day)	0.86±0.00
TDN (kg/day)	2.90±0.04
Apparent Nutrient Digestibility (%)	
Dry matter (DM)	38.14±2.24
Crude protein (CP)	49.00±3.10
Ether extract (EE)	50.25±7.01
Crude fibre (CF)	37.84±2.97
Nitrogen free extract (NFE)	35.66±3.88
Organic matter (OM)	39.53±2.46
Acid detergent fibre (ADF)	38.21±2.83
Neutral detergent fibre (NDF)	31.39±1.45
Acid detergent lignin (ADL)	35.04±3.24

Blood profile

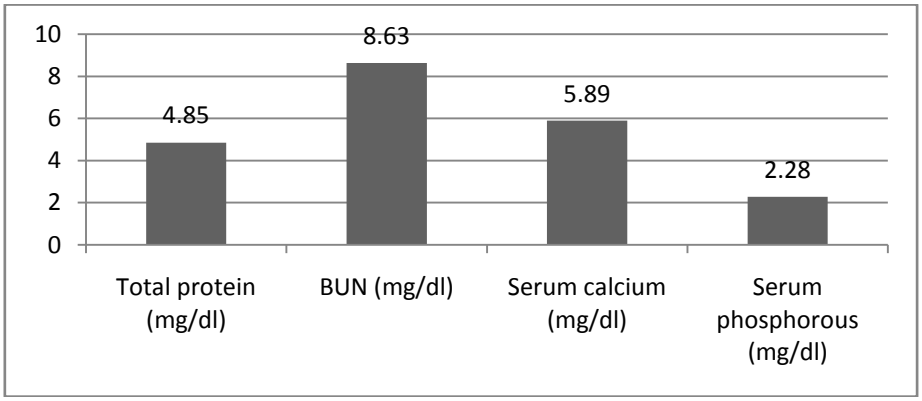
Plasma urea level is a predictor of both nitrogen utilization [14] and nitrogen intake [15] in ruminants. In the present study, the total protein and BUN level were estimated as 4.85±0.31 mg/dl and BUN 8.63±0.62 mg/dl, respectively which indicated that the intake and utilization of protein might be optimal in the dairy calves fed congo-signal based complete feed block (Fig.1). The serum Ca and P levels were also above normal [16].

CONCLUSION

The feeding of growing dairy calves in Mizoram is characterised by feeding of locally available grasses and tree fodders as roughage sources and congo-signal (*Brachiaria ruziziensis)* is one such fodder roughage extensively fed to the dairy calves. Utilization of

congo-signal (*Brachiaria ruziziensis)* with concentrate in the form of complete feed block might be more practical for the dairy calves to ensure optimal nutrient intakes and nutrient utilization.

Figure.1. Blood profile for total serum protein, BUN, serum calcium and phosphorous of dairy calves fed complete feed block of congo-signal grass (*Brachiaria ruziziensis)* as roughage source



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