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Effect of Supplementing Molasses Based Multi-Nutrient Liquid Supplement (MMLS) on Nutrient Intake, Digestibility and Growth Performance of Buffalo Calves

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ABSTRACT

Twenty-one buffalo calves (111±4.53 kg BW, 6-8 months age) were assigned to 3 groups (T_1, T_2 and T_3) consisting of 7 animals each in a completely randomized block design. Concentrate mixture composition was remained the same for all three groups; however, concentrate to wheat straw ratio were 60:40, 50:50 and 40:60 in groups in T_1, T_2 and T_3, respectively. Additional molasses based multi-nutrient liquid supplement (MMLS) was provided in T_2 and T_3 groups @ 5% and 10% DMI respectively. Daily intake of green oats, dry matter (DM), OM, NDF and ADF did not differ significantly (P>0.05) among groups. However, concentrates and EE intake were significantly (P<0.01) higher in calves of T_1 group followed by T_2 and T_3. Wheat straw (kg/d), CP (kg/d, kg/d $W^{0.75}$) and DCP (kg/d, kg/d $W^{0.75}$) intake were significantly (P<0.01, P<0.05) higher in MMLS treated groups when compared to control. The digestibility coefficient of DM, OM, CP, EE, NDF and ADF did not differ significantly among groups. Initial and final body weight, total weight gain, ADG, DMI and FCR were also comparable (P>0.05) among the groups. Reducing the amount of concentrate and replacing the reduced amount by MMLS @5% and 10%, depending on the concentrate to roughage ratio can increase the ADG and thus growth rate of buffalo calves without any adverse effects on DMI and digestibility of nutrients.

Key words: Buffaloes calf, Digestibility, Feed intake, Growth performance, MMLS

INTRODUCTION

Natural calamities, urbanization and rise in human population had an adverse impact on availability of animal feeds. Therefore, ruminants thrive mainly on poor quality feeds and pastures, which are having low content of nutrients and high content of lignin and silica; that limit their efficient utilization by ruminants. Animal nutritionists, have proved that the nutritive value of these crop residues can be enhanced if deficient nutrients are supplemented (Makkar, 2002; Singh and Singh, 2003). Addition of urea and molasses was found promising when either fed with or sprayed over poor quality roughages, or used as a urea-molasses (Maneerat *et al.,* 2015) as these supplements are good source of non-protein nitrogen, energy, minerals and vitamins. Moreover, liquid feed supplements offer an alternative delivery vehicle for supplemental fat, protein, and rumen-fermentable carbohydrates, minerals and vitamins in rations for lactating dairy cows (Ankita *et al.,* 2016). Little research has been done on molasses based multi-nutrient liquid supplement (MMLS) for improving the performance of ruminants. Therefore, an attempt was made to evaluate the effect of feeding MMLS on nutrient intake, nutrient digestibility and growth performance of male buffalo calves.

MATERIALS AND METHODS

The experiment was conducted for 126 days at Animal Nutrition Laboratory, ICAR-Indian Veterinary Research Institute, Izatnagar. Twenty-one buffalo calves (111±4.53 kg BW, 6-8 months age) were assigned to 3 groups *i.e.*, T_1, T_2 and T_3, consisting of 7 animals each in a completely randomized block design. Composition of the compounded concentrate remained the same for all three groups except that the amount of concentrate were given as 60%, 50% and 40% of the total requirements in groups in T_1, T_2 and T_3 and additional MMLS was provided in T_2 and T_3 groups

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@ 5% and 10% DMI after mixing with respected amount of concentrate taken for each animal. The ingredient and chemical composition of feed ingredients fed to the experimental animals is presented in Table 1.

All the buffalo calves were offered daily a weighted amount of respective concentrate mixture and/or MMLS in the morning at 10.00 AM to meet their nutrient requirements for maintenance and growth as per the guidelines of Kearl (1982) feeding standard. Wheat straw (*ad lib*) and green oats (10 kg) were provided after ensuring complete consumption of the concentrate mixture. Wheat straw refusals were weighted daily on the next morning to estimate consumption per day and sampled at weekly intervals for subsequent analysis of DM to assess the average DMI during the experimental period. All the animals were offered fresh and clean tap water free choice twice daily. The BW of the individual calf was recorded at fortnightly intervals in the morning before feeding and watering. A metabolism trial was conducted after 126 days of experimental feeding to assess the intake and digestibility of nutrients. Body weight of the experimental calves were recorded before and after metabolism trial on two consecutive days. During the trial, the buffalo calves were housed in individual metabolism cages fitted with removable feeders and arrangements for quantitative collection of faeces and urine separately. The trial lasted for 9 days with a 3 days adaptation period to accustom the animals to cages prior to 6 days collection and measurement period. Samples of feed offered and refused were collected daily quantitative estimation of intake. Faecal and urine outputs during 24 hours were recorded. A sub-sample of the faeces (1/100) was collected and dried at 80±2°C for 24 hours in a forced-draft oven for DM estimation. Pooled samples of 6 days for each animal were ground and stored for chemical analysis. The samples of feed offered, residue left and faeces voided were analyzed for proximate compositions as per standard procedures of Association of Official Analytical Chemists (AOAC,

Table 1. Ingredients and chemical composition of feeds offered

Particulars	Concentrate	MMLS	Wheat straw	Green oats
Crushed maize	35	-	-	-
Soyabean meal	30	-	-	-
Mustard Cake	05	-	-	-
Wheat bran	27	-	-	-
Cane molasses	-	77.0	-	-
Neem coated urea	-	10.0	-	-
DMSC	-	10.0	-	-
Mineral mixture	02	2.0	-	-
Common salt	01	1.0	-	-
Chemical composition				
OM (%)	90.85	87.03	92.45±0.08	90.59±0.21
CP (%)	22.23±0.13	35.36±0.06	3.15±0.09	8.93±0.14
EE (%)	2.14±0.07	1.32±0.01	1.28±0.06	2.06±0.06
Total ash (%)	8.79±0.49	12.97±0.01	8.73±0.14	8.26±0.31
NDF (%)	32.65±1.05	7.3±0.10	80.84±0.68	65.37±1.23
ADF (%)	9.95±0.25	6.16±0.12	51.86±0.41	36.61±1.26
Ca (5)	0.75±0.04	1.36±0.19	0.24±0.01	2.19±0.12
P (5)	0.41±0.06	0.43±0.02	0.13±0.01	0.52±0.18

DMSC: Deoiled mahua seed cake

2002). Data obtained were subjected to analysis of variance (ANOVA) using SPSS software (v11.0) and treatment means were ranked using Duncan's multiple range tests. Significant variance between treatments were measured at P<0.05. Statistical analysis were carried as for the procedures of Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

Data pertaining to mean feed intake and apparent digestibility of nutrients in different groups are presented in Table 2. Wheat straw intake was significantly (P<0.01) higher in calves of T_3 group. Calves of T_2 groups had an intermediate position between animals of T_3 and T_1 groups. Ankita *et al.* (2016) also observed higher intake of straw DM in MMLS supplemented group. The basal diet became more palatable due to incorporation of urea and molasses as evidenced from increase in wheat straw intake by MMLS treatment groups. The daily intake of DM, OM, NDF and ADF from oat fodder did not differ significantly (P>0.05) among treatments. However, EE intake was found to be higher in control group. The reduction of EE intake in the MMLS treated groups might be due to the higher EE content of concentrate mixture as compared to MMLS as evident from chemical composition. Similar results were also obtained by Anuraj *et al.* (2017) whilst 15% and 30% of the concentrate mixture were replaced by MMLS. On the other hand, CP intake was significantly higher in MMLS supplemented groups as compared to non-supplemented group.

EE digestibility was found to be lower than that of ADF. It may be due to supplementation of urea as a part of MMLS (Wu *et al.,* 2005). Data pertaining to plane of nutrition, ADG and FCR are presented in Table 3. Content of DCP (%) and DCP intake (g/d or g/kg $W^{0.75}$) was significantly (P<0.05, P<0.01) higher in T_3 followed by T_2 and T_1. On the other hand, there was no

Table 2. Mean intake (kg/d) and digestibility (%) of various nutrients in different groups

Particulars	Treatments			SEM	P value
	T_1	T_2	T_3		
Dry matter					
DMI (kg/day)	5.47±0.21	5.55±0.20	5.38±0.26	0.21	0.41
Digestibility	63.17±2.15	64.53±2.36	65.97±3.60	2.65	0.43
Organic matter					
Intake	4.95±0.12	5.08±0.12	4.81±0.10	0.11	0.42
Digestibility	64.73±1.12	65.05±1.27	66.87±0.90	1.07	0.22
Crude protein					
Intake	0.52^{b}±0.01	0.62^{a}±0.04	0.66^{a}±0.02	0.01	<0.01
Digestibility	69.42±1.24	70.49±2.17	69.21±2.82	1.90	0.79
Ether extract					
Intake	0.09^{a}±0.00	0.09^{ab}±0.00	0.08^{b}±0.00	0.00	<0.01
Digestibility	50.28±3.05	50.67±3.13	54.71±3.20	2.15	0.55
NDF					
Intake	2.37±0.06	2.32±0.08	2.46±0.13	0.05	0.56
Digestibility	61.39±1.28	58.98±2.24	64.07±3.79	1.52	0.41
ADF					
Intake	1.59±0.04	1.54±0.53	1.68±0.09	0.07	0.32
Digestibility	53.35±1.62	54.10±2.86	56.86±2.59	2.04	0.02

[abc]Means values with different superscripts within a row differ significantly (P<0.05)(P<0.01)

Table 3. Effect of MMLS on nutritive value, plane of nutrition and growth of buffalo calves

Particulars	Treatments			SEM	P value
	T_1	T_2	T_3		
CP intake (g/day)	520[b]	621[a]±22.24	660[a]±15.02	18.01	<0.01
DCP intake (g/day)	361[c]±24.23	437[b]±20.45	456[a]±19.21	20.02	<0.01
DCP intake, g $W^{0.75}$	7.2[b]±0.25	8.5[ab]±0.23	8.76[a]±0.25	0.21	<0.01
DOM, g $W^{0.75}$	64.64±0.16	64.46±0.45	61.88±0.26	0.29	0.55
TDN, gd^{-1}	3364±184.21	3470±90.32	3377±100.34	85.99	0.96
TDN, $gW^{0.75}$	67.93±1.23	67.72±1.17	65.06±2.15	1.55	0.81
Nutrient density					
DCP (%)	6.59[b]±0.43	7.87[ab]±0.45	8.47[a]±0.74	0.56	<0.05
TDN (5)	61.50±0.97	62.52±0.84	62.76±1.31	0.84	0.55
Body weight (kg)					
Initial	111±4.53	111.43±3.61	112.27±4.67	4.29	0.97
Final	182.09±7.61	190.43±4.9	194±9.94	7.76	0.54
Total gain	71.09±3.83	79±2.93	81.73±5.29	4.13	0.19
ADG (g/day)	560±28.12	630±20.18	650±20.15	0.03	0.19
Voluntary feed intake					
DMI (kgd^{-1})	5.47±0.15	5.55±0.17	5.38±0.21	0.15	0.75
Total DMI (kg)	689.22±25.25	699.3±20.23	677.88±23.25	20.45	0.12
DMI (%)	3.00±0.02	2.92±0.01	2.76±0.02	0.01	0.19
FCR	9.5±1.10	8.9±.0.95	8.3±0.96	0.88	0.07

[abc]Means values with different superscripts within a row differ significantly (P<0.05)(P<0.01)

significant (P>0.05) difference among the groups for the intake of DOM, TDN and TDN content of the diets. Results of this study corroborated well with those of Sahoo *et al.* (2004) who reported significant (P<0.01) increase in CP and DCP intake in the supplemented groups compared to control due to addition of urea through urea-molasses supplement and comparable intake of DM, DOM and TDN in all the groups, which is in agreement with our findings.

The digestibility coefficient of DM, OM, CP, EE, NDF and ADF did not differ significantly (P>0.05) among treatment groups. Similarly, Mohini and Singh (2010) also observed non-significant changes in digestibility of DM, OM and CP in crossbred dairy cows fed urea molasses mineral block (UMMB) replacing 35% of concentrate mixture and fed standard ration without UMMB. Initial and final BW, BW gain, DMI and FCR were comparable among the groups. In agreement with the result, Choubey *et al.* (2010) reported increase in BW gain of UMMB treated groups.

CONCLUSION

The findings of the present study revealed that reducing the amount of concentrate and replacing the reduced amount by MMLS @ 5% and 10% depending on the concentrate to roughage ratio can increase the ADG and thus growth rate of buffalo calves without any adverse effects on feed intake and digestibility of nutrients.

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