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Nutritional Intervention to Explore the Growth Potentiality of Malnad Gidda Calves

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ABSTRACT

The study was carried out to know the growth potentiality of Malnadgidda (MG) calves by providing different levels of nutrients by dividing nine calves into three groups of three calves each in switch over design.The calves in T1, T2 and T3 group were fed to support 100, 150 and 200 g gain per dayrespectively and total DMI (g/d) and average daily gain (g/d) in the corresponding groups were 749.6 and 152.3; 788.7 and 167.8; 871.6 and 181.3 respectively. The DMI on percent of body weight in the corresponding groups were 1.89, 2.09 and 2.27 respectively. There was no significant difference in nutrient and mineral intake between the groups.The digestibility of all the nutrients increased numerically and the retention of nitrogen increased as the weight gain increased but the difference was not significant between the groups. The DCP and TDN of the diet in T1, T2 and T3 were 7.95 and 55.6, 8.70 and 55.4, 56.2 and 9.03 % respectively. The total cost incurred in T1, T2 and T3 was Rs; 9.08, 9.76 and 12.2 per day respectively and cost of per kg body weight gain in corresponding groups was Rs; 59.3, 58.1 and 67.4. It was concluded that the MG calves had the potentiality of gaining only around 180g / day with an average DMI of 2.0% of body weight.

KEYWORDS: Digestibility, Economics, Malnad Gidda calves, Nutrient intake, Weight gain

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INTRODUCTION

Among several dwarf breeds of cattle in India, Malnad Gidda (MG) cattle, a unique breed confined to Western Ghats regions of Karnataka. The breed is reared commonly by the farmers at the foot hills of the region mainly for agricultural, milk and manure purposes. The urine and milk of Malnad Gidda cows are believed to have medicinal value as these animalsare maintained on grazing in the forest and consume variety of plants. The average birth weight of Malnad Gidda (MG) calves is 7.91±0.5 kg in elite cows and 5-10kg in randomly chosen cows (Ramesh, 2001). The birth weight of MG calves were similar to the birth weight of other dwarf breeds like Vechur and Punganur (Ekambaram et al.,2014).However, the growth potentiality of MG calves has not yet been explored. Therefore, the study wasplanned to know the growth potentiality of MG calves by providing different levels of nutrients to improve the overall feeding practices of MG calves for their growth performance.

MATERIALS AND METHODS

Nine MG calves (Av. body weight:35-36 kg, Age-3 to 5 months) from Malnad Gidda Research and Information Center (MGRIC), Veterinary College Campus, Shivamogga were divided in to three groups of three calves each based on body weight and age in switch over design. The calves were housed in individual calf pens, in an open protected shed and were provided with uniform management care with separate feeding and watering facility. All the experimental calves were dewormed and vaccinated for the common diseases before the start of the experiment. The individual calves in the experiment were allocated to one of the three dietary treatments. The treatments were designated as T1,

T2 and T3 to support 100, 150 and 200 g gain per day respectively as specified by NRC (2001). The calves were offered adequate paddy straw and hybrid napier Co-4. The concentrate feed mixture (CFM) with 21% CP and 11MJ ME/kg (Maize-55.5, SBM-28, WB-13.5, Min. mix.-1, DCP-1, Salt-1) was offered twice a day in equal proportions at 08.00 am and 03.00 pm daily. The metabolic trial was conducted for 5 days on all calves in each period where total collection of faeces and urine voided by each calf was done manually. The experiment was last for 3 months. During the experiment period daily feed intake and weekly body weight were recorded. The feed, fodder, dung samples of individual calves were subjected to proximate analysis (AOAC, 2016) and fiber fractions (Van Soest, et al., 1991). Nitrogen in urine was analysed (AOAC, 2016). Feed samples were analyzed for minerals (Atomic Absorption Spectrometry).Experimental data on DMI, nutrient intake, body weight gain, digestibility and density of nutrients in the diet were analysed by statistical analysis system (Graph pad prism, 2007. version 5.01).

RESULTS AND DISCUSSION

The paddy straw and hybrid napier were offered to all calves *ad libitum*. CFM was offered to meet the rest of the nutrient requirement of the calves to support 100, 150 and 200 g gain per day as per NRC (2001) and therefore, CFM quantity varied among the groups.The offered paddy straw contained 4.09 % CP, 68.36 % NDF and hybrid napier contained 4.65 % CP and 66.41 % NDF on dry matter basis. The CFM had 20.6 % CP, 2.36 % EE and 45.5 % NDF. The energy values calculated (ME, MJ/kg DM) for paddy straw, hybrid napier and CFM were 4.0, 8.0 and 11.0 respectively (Table 1). The chemical composition of paddy straw, hybrid napier and CFM were similar to the values reported in various studies (Ramachandra and Sampath, 1995; Dohnani et al., 2001;Rahman et al., 2010; Imran et al., 2017).

Table 1. Chemical composition (% DMB) of paddy straw, hybrid napier and concentrate feed mixture used in the feeding trial.

Particular	Paddy straw	Hybrid napier	CFM
OM	87.1	90.2	90.8
CP	3.54	3.40	20.6
EE	1.16	2.27	2.36
CF	32.5	30.5	33.9
NFE	49.9	54.0	33.8
TA	12.8	9.79	9.18
NDF	68.6	66.7	45.5
ADF	40.9	37.2	8.4
ADL	1.64	1.14	0.30
Minerals			
Calcium(%)	0.39	0.56	0.61
Phosphorus(%)	0.11	0.11	0.23
Magnesium (%)	0.11	0.41	0.46
Potassium(%)	7.42	9.53	3.52
Sodium(%)	0.32	0.92	0.21
Zinc(ppm)	62.8	25.8	68.4
Manganese(ppm)	238.4	32.6	59.4
Iron(ppm)	330.8	143.4	162.5

The calcium and phosphorous ratio in paddy straw, hybrid napier and concentrate feed mixture were 2.8:1, 3.6:1 and 2.6:1 respectively which were in the normal range. The other major minerals (Na, K, and Na) and minor mineral composition of feed stuffs varied which was due to type of soil and varieties used. Therefore, the variations existed between feedstuffs can't be reasoned exactly.

The MG calves with initial body weight of around 35kg gained 4.5kg during the experimental period and the average daily gain obtained in T1, T2 and T3 groups was 152.3, 167.8 and 181.3 g/d

respectively. Eventhough, there was no significant difference in weight gain between the groups, the additional nutrient supplied to support 100, 150 and 200 g gain per day achieved maximum of 181.3g/d as against 200g gain per day. It clearly indicated that the MG calves had the potential to gain only about 180g/d. Around 16.75 and 19.16% more gain was achieved in T2 and T3 respectively over T1. The gain achieved in MG calves was lower than the gain obtained in sahiwal calves (260g/d) and kankrej calves (318g/d) whereas marginally lower than dwarf breeds like vechur calves (220-310 g/d) and kasargod calves (218 to 227 g/d) (Bindya et al. 2001).

Table 2. Average daily body weight gain, dry matter, nutrient and mineral intake of experimental calves.

	T1	T2	T3	SEM	P-Value
Body weight (kg)					
Initial	35.3	35.7	36.5	1.39	0.94
Final	39.6	40.4	41.6	1.50	0.43
Gain, g/d	152.3	167.8	181.3	9.35	0.46
DM I, g/d					
Paddy straw	291.8	272.0	278.3	29.8	0.96
Hybrid napier	132.8	169.0	148.2	17.0	0.69
CFM	324.8	347.6	444.9	27.7	0.17
Total	749.6	788.7	871.6	68.9	0.77
DMI, % of BW					
Paddy straw	0.71	0.70	0.72	0.066	0.99
Hybrid napier	0.36	0.44	0.38	0.041	0.74
CFM	0.82	0.95	1.20	0.060	0.05
Total	1.89	2.09	2.27	0.142	0.55
FCR (kg feed consumed/kg gain)	4.90	4.70	4.82		
Feed efficiency (kg gain/kg DMI)	0.20	0.21	0.20		
Nutrient intake, g/d					
OM	643.4	680.8	744.1	59.6	0.79
CP	86.6	90.8	109.4	7.35	0.42
CF	235.7	251.5	279.5	22.1	0.73
EE	11.9	13.9	15.4	1.21	0.51
NFE	333.2	350.3	374.2	31.0	0.86
NDF	442.8	452.8	476.3	40.5	0.87
ADF	191.1	201.5	201.8	19.3	0.97
Mineral intake					
Calcium, g/d	3.90	4.17	4.67	0.35	0.76
Phosphorus, g/d	1.39	1.48	1.68	0.12	0.76
Magnesium, g/d	2.39	2.62	3.0	0.21	0.75
Potassium, g/d	4.58	4.85	5.04	0.44	0.78
Sodium, g/d	2.88	3.20	3.24	0.28	0.73
Zinc, mg/d	43.9	45.2	51.7	3.97	0.73
Manganese, mg/d	93.2	91.0	97.6	9.00	0.77
Iron, mg/d	168.4	170.7	185.6	15.8	0.77

Malnadgidda calves consumed maximum of around 270 to 290g DM from paddy straw (0.7% of b.wt.), 130 to 170g DM from hybrid napier (0.4% of B.wt.) and 325 to 445 DM from CFM (0.8 to 1.2% of B.wt.) when offered *adlibitum*. The total DMI was 749.62, 788.78 and 871.62g per day in T1, T2 and T3 groups respectively. The DMI on percent of body weight in the corresponding groups were 1.89, 2.09 and 2.27. The DMI of MG calves recorded in this study was much lower than DMI of Karan Fries calves (Rajesh Kumar et al., 2017), sahiwal calves (Sanjay Patel et al., 2016) and cross bred calves (Jasmine Rani et al., 2016) but similar to HF cross bred calves fed calf starter and Lucerne hay (Anand et al., 2016).Though, there was no significant difference in feedconversion ratio (FCR) and feed efficiency ratio (FER) between the groups, there was a better FCR and FCE in T2 group where calves were fed for 150g gain per day. These values were corroborated with the results of Jasmine Rani et al., (2016) and Anand et al., (2016). There was

no significant difference in nutrient intake between the groups. However, the CP intake was 86.60, 90.85 and 109.40 g/d in T1, T2 and T3 groups respectively and increased CP intake in T2, and T3 over T1 was due to higher daily gain. Not only CP intake, all the nutrient intake increased as the body weight gain increased due to higher demand for nutrients to support higher daily gain. The same trend was observed in mineral intake during the experiment. CP intake observed in this study was much lower than the intake recorded in other studies (Sanjay Patel et al., 2016; Rajesh Kumar, et al., 2017) because of higher average daily gain than MG calves.

As the level of nutrient intake increased, the digestibility of all the nutrients increased numerically but the difference was not significant between the groups. The OM digestibility in T1, T2 and T3 was 59.70, 61.55 and 62.58 % respectively whereas CP digestibility increased by 4.74% in T2 and 7.6% in T3 over T1. As the CP intake increased, the digestibility of CP and CF also increased. However, not much change in digestibility of NDF and ADF was observed between the groups. The digestibility of different nutrients were similar to the values obtained in other indigenous calves fed wheat straw and green oats/maize (Sanjay Patel et al., 2016; Rajesh Kumar et al., 2017). The nitrogen intake (g) was significantly ($P<0.01$) differ in different plane of nutrition followed during this experimental period. However, N retention (g/day) did not differ significantly. Similar trends were observed in the experiment conducted by Siddaramanna et.al., (2011).

The DCP and TDN (%) of the diet in T1, T2 and T3 were 7.95 and 55.6, 8.70 and 55.4, 9.03 and 56.2 which were not significantly different between the groups due to not much variation in the digestibility of nutrients. The same trend was noticed in ME and DOMD values of the diets in all the groups. The intake of DCP, TDN, DOMD and ME between the groups were not significant but intake of DCP, TDN, DOMD and ME increased as the weight gain increased due to higher level of nutrient supply. On contrary, in other indigenous calves, higher intake was observed (Sanjay Patel et al., 2016; Rajesh Kumar et al., 2017) when compared to MG calves.

Table 3. Nutrient digestibility, nitrogen balance and density of experimental diets in Malenadu Gidda calves

	T1	T2	T3	SEM	P-Value
Nutrient digestibility, %					
DM	56.6	58.6	59.5	0.95	0.45
OM	59.7	61.5	62.5	0.85	0.39
CP	65.6	68.7	70.6	0.91	0.07
CF	49.8	55.2	55.8	1.29	0.10
EE	57.6	61.1	64.3	1.87	0.35
NFE	62.1	61.2	62.5	1.77	0.32
NDF	54.7	54.0	55.3	1.44	0.93
ADF	40.2	38.7	40.0	1.94	0.94
N-balance, g/day					
Intake**	16.74[a]	19.63[ab]	22.16[ab]	0.95	0.001
Fecal out go	5.21	5.38	6.39	0.46	0.511
Urine out go**	3.95[a]	5.99[ab]	6.39[ab]	0.37	0.001
Retained, g/d	7.58	8.26	9.38	0.54	0.407
Nutrient Density					
DCP, %	7.95	8.70	9.03	0.23	0.17
Intake, g/day	59.5	68.6	78.7	5.26	0.23
TDN, %	55.6	55.4	56.2	1.17	0.95
Intake, g/day	435.7	497.2	532.4	40.43	0.63
ME, MJ/kg	8.40	8.37	8.50	0.17	0.07
Intake, MJ/day	6.30	6.60	7.41	0.12	0.16
DOMD, %	53.9	52.8	53.4	1.15	0.94
Intake, g/d	423.7	478.2	506.1	39.21	0.70

** $P \geq 0.01$, Means bearing different superscripts in a row differ significantly

The total cost incurred towards feeding of Malnad Gidda calves with the dietcomprising paddy straw, hybrid napier and CFM in T1, T2 and T3 was worked out to be Rs; 9.08, 9.76 and 12.20per day respectively and cost of per kg body weight gain in corresponding groups was Rs; 59.35, 58.10 and 67.40 (Table 4)which was significantlydifferent between groups and higher cost per kg of weight gain was observed inT3 followed by T1 and T2 because the nutrient supplied was more in T3 for higher gain than T1 through higher quantity of CFM which invariably increased the cost of weight gain compared to other groups. Inaddition, there is demand for urine for preparations of medicines and sanitarysolutions and dung is extensively used for organic manure purpose both wereexcluded for economics calculation. If these two components are included with weight gain for calculation of profit, the margin of the profit would have further increased.

Table 4. Economics of weight gain in Malnad Gidda calves

Particular	T 1	T 2	T 3
Feed consumed (kg/d)			
Paddy straw	0.30	0.28	0.29
Hybrid napier	0.39	0.49	0.43
CFM	0.34	0.37	0.47
Total cost (Rs)			
Cost of labor (milking, cleaning of shed and animals)	--	--	--
Paddy straw	0.30	0.28	0.29
Hybrid napier	0.39	0.50	0.44
CFM**	8.38	8.98	11.47
Total cost	9.08	9.76	12.20
Weight gain per day (kg)	0.153	0.168	0.181
Cost per kg weight gain	59.35	58.10	67.40

Cost: Paddy straw (Rs) 1.0/kg, Hybrid Napier (Rs.).1.0/kg and CFM (Rs.). 24/kg

CONCLUSION

It was concluded from the results of the study that the MG calves have the maximum potentiality of gaining only around 180g per day with an average dry matter intake of around 2.0 per cent of body weight. Nutrient intake and digestibility of nutrients increased as the weight gain increased. MG calves can be fed 9% CP and 6% ME less than NRC (2001) recommendation for maximum weight gain. However, it indicated that supplementary feeding is necessary to support additional gain than maintaining calves on traditional system of grazing alonein Western Ghat regions of Karnataka.

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