

Original Research Article

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Effect of Total Mixed Ration Feeding with Roughage: Concentrate Ratio of 60:40 on Performance and Residual Feed Intake of Crossbred Cows

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ABSTRACT

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High yielding crossbred cows are fed high amount of concentrate which poses metabolic disorders. TMR feeding is suitable for high concentrate feeding. RFI is a measure of efficiency which has not been explored in crossbred cows. Therefore present study was undertaken to study the effect of TMR feeding of performance and RFI in crossbred cows. Twelve cows were divided in to two groups of six animals each and fed ration with 60:40 roughage: concentrate ratio. The animals were fed individually and daily feed intake and refusal were recorded. The DM intake was calculated. The data showed that the DM intake of was similar in both the groups. On DMI basis, RFI, when calculated on DMI basis, was significantly ($P < 0.05$) lower in TMR as compared to NON-TMR. The digestibility of DM, CP, ADF, NDF and TDN was significantly ($P < 0.05$) higher in TMR as compared to NON-TMR. The TMR feeding had significantly positive ($P < 0.05$) effect on milk production, and milk energy yield. The RFI had negative correlation with intake and digestibility parameter of ration.

Introduction

The feeding system based on TMR is ideal for the high yielding dairy animals because when fed high concentrate ration these animals are prone to metabolic disorder like acidosis, lameness etc. These problems could be minimized or totally eliminated when feeding is done as TMR. Residual feed intake can be calculated by measuring an animal's actual feed intake and estimating what the animal should be eating based on gain and production. Estimated feed intake is then subtracted from actual feed intake. Genetic

selection to reduce RFI can result in progeny that eat less without sacrificing performance (Herd *et al.*, 1997 and Richardson *et al.*, 1998). There are not many studies on TMR feeding and RFI in crossbred cows. Therefore, present experiment is planned to study the effect of TMR feeding on performance and RFI of lactating crossbred cows.

Materials and Methods

The concentrate was prepared for formulating TMR as per table 1. The TMR consisted of

concentrate- 7 kg, wheat straw-2 kg and non-legume silage-36 kg (adjusted weekly on DM basis).

The experiment was conducted at Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana. Twelve cows were divided in to two groups of six animals each and fed ration with 60: 40 roughage: concentrate ratio. The animals were fed individually and daily feed intake and refusal was recorded. The DM, OM, CP, NDF, ADF, EE and energy intakes were calculated. The cows were stall fed throughout the experimental period. Fresh and clean water was provided thrice a day i.e. morning, afternoon and evening throughout the experimentation. Proper hygienic conditions and healthy surrounding were maintained in the shed throughout the experimental feeding period. During the research period, health status of cows was monitored regularly. This feeding experiment was of 45 days duration

The sample of feed and refusal were taken twice weekly for analysis for proximate principles (AOAC 2000) and cell wall fractions (VanSoest, 1963). The body weight of animals was recorded fortnightly. The milk was measured daily and milk composition was estimated at weekly intervals. Residual feed intake estimation was measured by the method given by (Koch *et al.*, 1963). The estimated intakes was calculated from regression of actual intake energy yielded in milk MJ/d (LE) and live body weight changes (expressed per unit metabolic body size defined as LW) and the fitted values taken as estimated intakes (Veerkamp *et al.*, 1995). Actual intakes were regressed on milk yield, milk energy yield and the two way interaction between milk yield (MY) and live weight change (LWC). The actual ME intake and predicted ME intake were also estimated. The correlations of RFI with various animal and dietary parameters were calculated.

Experimental feeds offered to crossbred cows in different groups

Experimental group	Experimental feed
NON-TMR	Silage + Wheat straw + concentrate without mixing
TMR	Silage + Wheat straw + concentrate with proper hand mixing

A digestion trial was conducted for 7 days on all experimental cows after 50 days of feeding trial. Collection of faeces was done on 24 hourly basis. Simultaneously daily feed offered and residue left was recorded. The representative samples of feed offered, residue left and faeces voided were collected and analyzed for proximate principles by the methods of (AOAC 2000) in order to determine the digestibility of different nutrients viz. dry matter, crude protein, ether extract, total ash, ADF and NDF.

Results and Discussion

The data showed that the DM intake was similar in both the groups. On DMI basis, RFI, when calculated on DMI basis, was significantly ($P < 0.05$) lower in TMR as compared to NON-TMR (Table 2).

Data revealed that the digestibility of DM, CP, ADF, NDF and TDN % was significantly ($P < 0.05$) higher in TMR as compared to NON-TMR, however, mode of feeding had no significant effect on OM, EE and CHO digestibility (Table 2). Raja Kishore *et al* (2013) reported similar results. They found that the DM intake (kg/d) was similar in TMR and non-TMR groups in buffalo bulls. They found that the digestibility (%) of CP, EE, CF, NDF, ADF, hemi-cellulose and cellulose were higher ($P < 0.01$) in animals fed complete rations than those fed conventional ration.

The data pertaining to effect of mode of feeding as TMR or NON-TMR on ilk

production and composition in low concentrate group is given in table 3. The TMR feeding had significantly positive ($P < 0.05$) effect on milk production, and milk energy yield. However, the milk protein % was significantly ($P < 0.05$) higher in NON-TMR as compared to TMR.

This might be due to some sorting of feed ingredients taking place in NON-TMR group. TMR and NON-TMR had no significant effect on milk/kg MBW, fat %, fat yield, protein yield and FCM. Gupta *et al* (2014) found overall average increase in milk production by 18.22% in cows fed TMR. They concluded that feeding of TMR is beneficial for proportionate intake of all feed ingredients, overall feed intake and better

digestibility of nutrients resulting into higher milk production. Schraufnagel (2007) also reported that TMR has a positive effect on milk yield and profits. Similar results are reported by Bargo *et al.*, (2002).

The RFI had negative correlation with intake and digestibility parameter of ration (Table 4). Richardson and Herd (2004) also found negative correlation between RFI and digestibility.

They performed a divergent selection experiment for residual feed intake in Angus beef cattle progeny to help determine mechanisms underlying the variation in RFI. They found a correlation of -0.44 between RFI and digestibility.

Table.1 Composition of TMR fed to animals

Parameter	Composition, % DM
OM	91.47
CP	14.34
NDF	42.61
ADF	25.86
EE	3.06
Ash	8.53

Table.2 Effect of TMR or NON-TMR ration on intake, nutrient digestibility and RFI

Parameter	TMR	NON TMR	SE	p value
DMI, kg/day	17.50	17.45	0.06	0.33
Digestibility coefficient %				
DM	65.76	61.88	1.30	0.001
OM	70.26	71.25	0.77	0.37
CP	69.64	66.72	1.23	0.05
EE	80.42	78.35	1.04	0.06
NDF	60.24	52.80	2.40	0.001
ADF	65.86	63.67	0.86	0.03
CHO	63.04	61.33	0.99	0.12
TDN %	64.59	62.06	1.07	0.04
RFI, kg/day(DM)	-2.69	1.07	0.01	0.03

Table.3 Effect of TMR or NON-TMR ration on Milk production and composition

Parameter	TMR	NON-TMR	SE	p valve
Milk yield kg/day	14.81	12.02	0.77	0.05
Milk/kg MBW	0.53	0.50	1.45	0.20
Milk energy yield, MJ/day	45.96	40.92	1.91	0.02
Fat %	3.69	3.77	0.18	0.38
Fat yield kg/day	0.55	0.45	0.03	0.09
Protein %	3.00	3.11	0.08	0.04
Protein yield kg/day	0.44	0.37	0.04	0.21
FCM kg/day	14.86	13.16	1.25	0.10
RFI	- 1.36	1.14	0.45	0.001

Table.4 Correlation of RFI with different intake and digestibility parameter

Parameter	Correlation
DMI kg/day	-0.27
OMD	-0.78
DMD	-0.84
AFMD	-0.68
NDFD	-0.61
EED	-0.56
ME INTAKE MJ/day	-0.85
NE INTAKE MJ/day	-0.85

In conclusion, TMR and NON-TMR had non-significantly effect on intake parameter. Nutrient digestibility is significantly ($p < 0.05$) higher for DM, CP, EE, ADF, NDF and TDN in TMR compared to NON-TMR rations. The TMR had significantly ($p < 0.05$) positive effect on milk yield, milk energy yield and FCM yield. TMR had significantly ($p < 0.05$) lower RFI as compared to NON-TMR indicating better efficiency in TMR groups. The correlation of RFI with DMI, OMD, DMD, AFMD, EED, NDFD, MEI, NEI was negative.

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