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## Production performance comparison of lactating buffaloes on feeding of total mixed ration versus conventional feeding

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**Abstract**

Total mixed ration is a balanced feed mixture that improves feed utilization thus improving reproductive and productive performance of animals. In present study a total of 40 lactating buffaloes were selected and categorized into two groups having 20 buffaloes each. Control group (T0) animals were on conventional feeding practice and treatment group (T1) was fed with TMR in a early lactation period of 120 days. The average milk yield (kg/d) was found significantly higher ( $P < 0.05$ ) in T1 ( $7.90 \pm 0.14$ ) than T0 ( $6.82 \pm 0.11$ ) with average increase milk yield by 1.13 L/day. TMR fed buffaloes also showed increased milk protein content (3.15 Vs 3.3%). The milk fat %, SNF also found higher in T1 with no significant difference. Percent increase in milk yield found to be 14.3% by TMR feeding. Thus it can be concluded that TMR is cost effective and can serve as a potential balanced ration for the lactating buffaloes for the enhancement of productivity.

**Keywords:** Buffalo, fat, milk yield, ration, solid not fat

**Introduction**

India is tropical country, where majorities of bovine population depends on poor quality feed including crop residues and agro-industrial by-products for feed [1]. In our country most of the livestock keepers are smallholder farmers with suboptimal producing animals due to unavailability of resources and unaffordable price of good quality feed. In addition, although available these feed resources are not efficiently and fully utilized due to unawareness about balanced rations feeding. In most of the tropical countries, there is no feeding standard due to lack of scientific balanced ration computation. Both the resource poor and lack of awareness about feeding standard further suppress the production performance of animals. Since long time conventional method of feeding is being practiced in large ruminants consisting of roughage and concentrate feeding separately at different time intervals, allows selective consumption of feeds resulting in feed wastage and improper nutrient utilization. In turn it affects the ruminal digestion, nutrient absorption and rate of passage by completely disturbing the rumen environment. Besides this in conventional feeding system, animals are more at a risk of ruminal acidosis because of high consumption of concentrates [2].

Total mixed ration (TMR) is a feeding technology of mixing concentrate and forage together in a balanced and calculated amount to fulfill nutrient demands of animals. TMR is a formulated feed mixture of forage, grains, minerals, vitamins and salts after weighing to form a complete balanced ration. TMR avoids selective feeding and each bite of feed consumed by animal will contain the same proportion of forages and concentrates. Such technology of feeding also minimises feed wastage and thus decreases unwanted economic loss in feeding. TMR as a complete feed helps in improving nutrient utilization, resulting in optimum productive and reproductive performance of the animals. TMR diets have often been attributed to a ruminal steady state condition, stabilize rumen fermentation pattern and improve energy and protein utilization in the rumen [3]. TMR feeding increased milk yield by 10-15% and animals persist in lactation for a longer time [4]. This technology can proved to be the beneficial feeding technology to solve the problems of unbalanced feeding in our country in large ruminants. Keeping in view the aforesaid facts, the present study was designed to compare the production performance of lactating buffaloes with TMR feeding and conventional feeding.

## Materials and Methods

The experiment was conducted at farmers field of Neemuch district (Madhya Pradesh, India). For the trial a total of 40 lactating buffaloes were selected and categorized into two groups having 20 buffaloes each based on their average milk yield (5.61 L/day) and parity (1-5). The animals in control group (T0) were fed on conventional ration of paddy straw, green fodder and concentrate mixture separately as per recommendation of NRC 2001. In the treatment group (T1) TMR was fed over conventional feeding practice of ration. The experimental diets (Table 1) were offered to the buffaloes in 40:60 concentrate and roughage ratio. Conventional feeding i.e. separate feeding of concentrate and roughage, the same concentrate and roughage fed as total mixed ration (TMR) prepared after chopping the dry and green fodder and mixing with concentrate in balanced and calculated amount. The effect of TMR feeding in lactating buffaloes was studied in a early lactation period of 120 days. The animal were fed twice a day, morning (8:00- 9:00 AM) and evening (3:00-4:00 PM). Buffaloes were hand milked twice a day: early morning (5:00-6:00 AM) and (5:00-6:00 PM).

**Table 1:** Composition of ration in two groups (per 100 kg of DM)

Particulars	T1	T2
Paddy Straw	20	20
Bajra green fodder	40	40
Concentrate	40	40

## Preparation on of total mixed ration

Total mixed ration for T1 was prepared manually by the farmers at farmers field as demonstrated. Firstly the weighed quantity of paddy straw and green fodder was chopped with help of power driven chaff cutter. Thereafter weighed quantity of concentrate was added to the chopped fodder and mixed. At the same time here mineral mixture was added, mixed at the rate of 50-60 gram per animal and salt at rate of 0.5-1%.

## Milk yield and composition recorded during lactation trial

Daily milk yield and milk composition of individual buffaloes was measured using digital weighing balance and automatic milk analyzer (Lactoscan SL milk analyser) respectively. The samples from morning and evening milking were pooled proportionately fortnightly and were subjected to fat, protein, lactose, solid not fat and total solid and tabulated.

## Statistical Analysis

The whole data was analyzed by t-test using SPSS 19.0.0 (for windows; SPSS, Inc., Chicago, IL, USA). Differences with probabilities ( $P$ )  $\leq$  0.05 were considered significant. Data were presented as Mean $\pm$ SE.

## Result and Discussion

Effect of total mixed ration on average fortnightly milk yield (kg) in lactating buffaloes is presented in table 2. Daily milk yield in the beginning of experiment were 5.65 and 5.58 L/day in T0 and T1 respectively, and at the end of 4 months of experimental feeding, overall average daily milk yield were 6.82 $\pm$ 0.11 and 7.90 $\pm$ 0.14 L/day in T0 and T1, respectively with 14.3% increase in milk yield. There was difference ( $p$ <0.05) in milk yield among the two groups. Milk production was highest for TMR feeding practice when compared to conventional feeding practice in cows [4, 5, 6, 7] due to increase in feed intake and better utilization of feed.

Blended and mixed diet feeding resulted in more milk with higher ME utilization efficiency for milk production [8]. However there was no difference reported and milk yields found to be similar in cows fed forage and grain separately and to those fed total mixed ration [9, 10].

**Table 2:** Effect of total mixed ration on average fortnightly milk yield (L) in lactating buffaloes

Fortnight	T0	T1
0	6.51 $\pm$ 0.46	7.91 $\pm$ 0.50
1	6.86 $\pm$ 0.52	7.51 $\pm$ 0.76
2	7.40 $\pm$ 0.41	8.44 $\pm$ 1.01
3	6.48 $\pm$ 0.26	7.52 $\pm$ 0.56
4	6.71 $\pm$ 0.61	7.51 $\pm$ 0.29
5	6.73 $\pm$ 0.56	7.83 $\pm$ 0.27
6	7.20 $\pm$ 0.35	8.67 $\pm$ 1.12
7	6.74 $\pm$ 0.28	7.83 $\pm$ 1.03
Mean $\pm$ SE	6.82 $\pm$ 0.11 <sup>a</sup>	7.90 $\pm$ 0.14 <sup>b</sup>

Means with a different superscripts (a,b) in a row differ significantly ( $P$  $\leq$ 0.05)

The average milk fat content (Table 3) reported to be higher in T1 (7.50 $\pm$ 0.09) than T0 (7.27 $\pm$ 0.12) with non significant difference. The milk fat content was higher by 3.1% in T1 over that of T0. Increase in fat content in T1 might be attributed due to increased digestible non detergent fibre intake in this group as compared to other group. The result was in concordance with report of [10, 11, 12] where the non significant effect on milk fat percentage in TMR fed cows and buffaloes were observed. In contrast to present findings there was a significant increase in milk fat on TMR feeding animals [4, 13, 14, 15, 16, 17].

**Table 3:** Effect of feeding total mixed ration on milk fat (%) at fortnight interval in lactating buffaloes

Fortnight	T0	T1
0	7.12 $\pm$ 0.28	7.87 $\pm$ 0.44
1	7.40 $\pm$ 0.66	7.75 $\pm$ 0.38
2	7.51 $\pm$ 0.48	7.58 $\pm$ 0.57
3	7.22 $\pm$ 0.55	7.65 $\pm$ 1.05
4	6.91 $\pm$ 0.31	7.48 $\pm$ 1.20
5	7.31 $\pm$ 1.02	7.25 $\pm$ 0.48
6	7.91 $\pm$ 1.21	7.50 $\pm$ 0.24
7	6.80 $\pm$ 0.29	6.99 $\pm$ 1.56
Mean $\pm$ SE	7.27 $\pm$ 0.12	7.50 $\pm$ 0.09

Similarly, the average protein content in milk was 3.15% and 3.3% for T0 and T1 respectively. It was higher in T1 than T0 during the experimental period but there was no significant difference. Similar results was also reported by [5] where the protein percent in TMR group was higher when compared to separate grain and roughage feeding. Further the present study was in agreement with [4, 10, 11, 12, 13, 16, 17] did not observe any significant change in protein content on two groups. In contrary [14, 17, 18, 19, 20, 21, 22], reported significant increased level of protein content in milk for TMR feeding as compared to the conventional feeding practice. The reason for increase milk protein may be due to numerically increase in gross protein efficiency [17] in mixed ration.

The mean values milk lactose contents in two groups T0 and T1 were 4.6% and 4.5% respectively. Statistical analysis revealed no difference in dietary treatments on milk lactose content over a period of seven fortnights which is similar to results of [4, 19].

Effect of feeding total mixed ration on milk total solids (%) at fortnight interval in lactating buffaloes is presented in table 4. The average total solids contents in milk observed to be significantly ( $P<0.05$ ) higher in T1 (16.68±0.21%) when compared to T0 (16.03±0.12%). Here, the average solid not fat (SNF) contents of milk in T1 (9.21%) found to be higher than T0 (9.02%) but no significant difference was observed. The result was in agreement with the findings of [15, 17, 23] who also reported higher SNF and total solids in milk of buffaloes and cows fed with conventional diet as compare to TMR. Contrary to this there was no significant variations of SNF contents in milk between groups [4]. So it can be said that the difference in milk composition may be due to lot of factors that govern variation like breed, genetic makeup, feeding regimen, season, time and interval of feeding and milking.

**Table 4:** Effect of feeding total mixed ration on milk total solids (%) at fortnight interval in lactating buffaloes

Fortnight	T0	T1
0	16.00±0.28	16.05±0.18
1	16.26±0.21	16.56±0.31
2	16.11±0.08	17.54±0.13
3	15.48±0.50	15.98±0.37
4	16.32±0.69	16.42±0.10
5	16.44±1.20	17.34±1.30
6	16.32±0.30	16.35±0.12
7	15.58±0.13	17.26±0.35
Mean±SE	16.03±0.12 <sup>a</sup>	16.68±0.21 <sup>b</sup>

Means with a different superscripts (a,b) in a row differ significantly ( $P<0.05$ )

### Conclusion

Total Mixed Ration proved to be a complete balanced ration having a significant effect on production performance of bovines in terms of milk yield and fat percent. It improves the net income due to non selective feeding, minimal feed wastage and more milk production per buffalo per day making it cost effective for farmers. Hence TMR when compared to conventional feeding ration can serve as a potential balanced feed for lactating animals minimizing both cost and labour.

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