



SHORT COMMUNICATION

Indian J. Anim. Nutr. 2025. 42 (3): 474-479

doi: 10.56093/IJAN.v42i3.20

Indian Journal of
Animal Nutrition

Bypass Fat Supplementation in Buffalo

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Effect of Bypass Fat Supplementation on Productive Performance of Buffaloes

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ABSTRACT

One farm trial was conducted to assess the effectiveness of bypass fat on overall performance of milch buffalo during 2022-23 in the Khijrabad, Sohali and Khubahedi village of SAS Nagar district of Punjab. Twenty lactating Murrah buffaloes were selected and distributed equally in two groups of ten buffaloes in each group, i.e. T1 (control) and T2 (supplementation bypass fat @ 100g/day/ buffalo) up to 150 days. The results of study revealed supplementation of bypass fat had significantly ($P<0.05$) increased the milk production in milch buffalo. The mean milk yield during the recoding was found to be 10.19 ± 0.36 and 11.29 ± 0.34 l/day in group T1 and T2, respectively; which was 10.78 percent higher in group T2 than the control. The average length of the postpartum estrus cycle (67.70 ± 6.20 days) and service period (91.43 ± 8.33 days) was significantly ($P<0.05$) reduced in T2 than T1 (86.40 ± 11.57 days and 131.00 ± 12.33 days, respectively). AI per conception was significantly ($P<0.05$) lower in T2 group (1.57 ± 0.40) than the T2 (2.71 ± 0.44). The study indicate that supplementing bypass fat in the diet had a significant ($P<0.05$) positive impact on both milk yield and postpartum reproductive performance in milch buffalo.

KEYWORDS: Buffalo, Bypass fat, Milk, Production, Reproduction.

Article received: 21 August 2025; Article accepted: 12 September 2025.

In many developing countries, including India, animals are primarily fed with agricultural by-products and low-quality crop residues, characterized by their inherently poor nutritive value and digestibility. These feed and fodder don't meet the needs of dairy livestock in terms of nutrients, optimal reproductive function, and long-term milk production (Khadda et al., 2014). The energy demand, especially during early lactation stages, is significantly higher than the available supply, limiting the production potential of animals (Sirohi et al., 2010). Bypass fat technology increases rumen energy density, enabling animals to fulfill key fatty acid requirements, enhance productive and reproductive performance (De Veth et al., 2009). Adding bypass fat to the diet of lactating animals is known to increase energy intake in early lactation, thereby reducing the negative effects of acute energy deficiency on lactation. (Tyagi et al., 2010). Considering the aforementioned details, on farm trail was undertaken to assess the effect of bypass fat supplementation on the overall performance of milch buffalo in Punjab, India.

One farm trial was conducted to assess the effectiveness of bypass fat on overall performance of milch buffalo during 2022-23 in the Raipur village of SAS Nagar district of Punjab. Twenty Murrah buffaloes in early phase of lactation were selected and alienated equally in two groups of 10 buffaloes in each group, i.e. T1 (control) and T2 (supplementation bypass fat @ 100g/ day/ buffalo beside the farmer practices). All animals were managed under farmers' own traditional feeding consisted of 5-6 kg wheat straw as dry fodder and 25 kg green maize fodder with concentrate mixture @ 4.5 kg per day/ animal. The buffaloes were selected at nearly the same body weight, milk yield, second or third parity and early lactation stage. The bypass fat was taken from the Department of Animal Nutrition, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana. In the treatment group (T2), consistent supplies of bypass fat as supplementations were offered without interruption during the entire period of study. To manage internal parasites, fenbendazole was used as dewormer and

given to every animal prior to the experiment's commencement. The buffaloes were fed the feed separately, and the percentage intake per head per day was also recorded. The drinking water was offered *ad-lib*. The data recording of trial was taken up to 150 days. The milk recording was conducted in the morning and evening time fortnightly. Milk samples were taken fortnightly at milking time and examined for milk composition i.e. SNF, milk fat, total solid, milk protein and lactose by milk scanner and 6% fat correct milk was computed using the formula (Rice et al., 1970): 6% FCM yield (kg) = 0.308x total milk (kg) + 11.54 x total fat (kg). Reproductive performance concerning the onset of

post-partum estrus, service period and AI per conception was also recorded. The significance of the difference between treatment means was evaluated using the Student's t-test after statistically analyzing the data in completely randomized design (CRD) (Snedecor and Cochran 1989).

The proximate composition of wheat straw, green maize fodder and concentrate mixture is presented in Table 1. The dry matter (DM), organic matter (OM), crude protein (CP), crude fiber (CF), ether extract (EE), nitrogen-free extract (NFE), and total ash content in the concentrate mixture were 90.05, 91.94, 21.03 and 11.56, 5.02, 54.33 and 8.06 per cent, respectively.

Table 1. Chemical composition of feedstuffs used during the on farm trial (% on DM basis)

Particular	Concentrate mixture	Wheat straw	Green maize fodder
OM	90.50	91.40	95.00
DM	90.05	91.94	21.03
CP	21.40	3.60	8.10
EE	5.10	0.83	2.28
Cellulose	12.30	41.00	35.10
NDF	34.50	79.20	62.30
ADF	16.30	59.80	38.60
Hemicellulose	18.20	19.40	23.70
ADL	5.40	7.50	4.00
Total Ash	10.10	8.10	4.94

The addition of bypass fat in diet did not affect the body weight of the buffaloes under experimentation (Table 2). The results of this trial are under the findings of Ranaweera et al. (2020) and Sadrasaniya et al. (2022). The data related to dry matter intake (DMI) during the study period was found to be 13.49±0.04 and 13.53±0.06 kg/d in T1 and T2 groups, respectively (Table 2). Supplementary

feeding of bypass fat did not influenced the DM intake (in terms of kg/d and DMI %) in lactating buffaloes which could be attributed to inertness of the added fat in rumen because of its low solubility. Corresponding results were also published by Sadrasaniya et al. (2022) for Mehsana buffaloes and Mane et al. (2017) and Sihag et al. (2020) for crossbred cattle.

Table 2. Effect of supplementary bypass fat feeding on production performance of lactating buffalo

Particulars	T-1 (Control)	T-2 (<i>Bypass fat</i>)
Initial body weight (kg)	498.2 ±6.39	496.7±8.54
Final body weight (kg)	505.8 ±9.54	504.2±5.77
DMI (kg/d)	13.49±0.04	13.53±0.06
DMI (% of BW)	2.67±0.02	2.68±0.01
Initial Milk yield (l/d)	10.10±0.42	10.00±0.26
Av. Milk yield (l/d)	10.19 ^b ±0.36	11.29 ^a ±0.34
6FCM yield (l /d)	11.83 ^b ±0.43	13.64 ^a ±0.36
% Increase in milk yield	-	10.78
% increase in FCM yield	-	15.30
Fat %	6.57 ^b ±0.53	7.21 ^a ±0.46
Total fat (kg/d)	0.69	0.81
Lactometer reading	29.92 ±2.23	30.48 ±2.31
Milk protein (%)	3.89	3.86
Lactose (%)	5.31	5.28
SNF %	9.81±0.21	9.73±0.23
Total solid %	16.38	16.94

Group mean with different superscripts differed significantly ($p < 0.05$).

The findings showed that the buffaloes supplemented with bypass fat (T2) produced significantly ($P < 0.05$) higher average daily milk yield and 6 % FCM yield in contrast to the T1, which was 10.78 percent higher in group T2 than control (Table 3). Buffaloes in group T2 produced 15.30 per cent higher 6% FCM than control (T1). More FCM production in buffalo indicated better utilization of nutrients due to bypass fat. Increased milk yield by feeding of bypass fat were also reported earlier by various researchers (Kumar et al. 2019, Saxena et al. 2019, Hifzulrahman et al. 2020, Butt et al., 2020, Rajneesh et al., 2021). This increase in milk yield is probably attributed to the greater energy density of the ration provided by the bypass fat, which helps

mitigate the negative effects of energy imbalance in by dairy animals. Fat % in milk was significantly ($P < 0.05$) higher in group T2 (7.21±0.46) as compared to control (6.57±0.53). Kirovski et al. (2015) also reported increased milk fat content as a consequence of feeding protected fat. There was no discernible variation in the content of solids-not-fat (SNF), milk protein, and lactose among the treatment groups, indicating that the supplementation of bypass fat in lactating buffaloes did not affect these parameters. Similar results were also reported by Naik et al., 2009, Tyagi et al., 2009 and Sirohi et al., 2010. However, the total solid content in milk was significantly higher in group T2 compared to the T1. Rohila et al. 2018 also reported increase TS in milk.

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Table 3. Effect of bypass fat supplementation on reproductive performance of lactating buffalo

Particulars	T-1 (Control)	T-2 (<i>Bypass fat</i>)
Post-partum oestrus (days)	86.40 ^b ±11.57	67.70 ^a ±6.20
Service period (days)	131 ^b .00±12.33	91.43 ^a ±8.33
No. of services (AI) per conception	2.71 ^b ±0.44	1.57 ^a ±0.40

Group mean with different superscripts differed significantly ($p < 0.05$).

The mean duration of postpartum estrus period and service period (67.70±6.20 days and 91.43±8.33 days) was reduced significantly ($P < 0.05$) in T2 group than T1 (86.40±11.57 days and 131.00±12.33 days), respectively (Table 4). The services per conception was also observed to be significantly ($P < 0.05$) higher in T1 group than the T2. The no. of AI per conceptions in T2 and T1 group was recorded 1.57±0.40 and 2.71 ±0.44, respectively. The findings indicated that supplementing bypass fat in the diet significantly ($P < 0.05$) affected the postpartum reproductive performance in milch buffalo. The results of this study corroborate with the findings of (Savsani et al. 2013 and Ramteke et al. 2014, Prajapati 2018). The onset of cyclicity appears to be associated with involution process of uterus. Research suggests that the duration of uterine

involution may be shortened with supplementation of bypass fat, potentially leading to an earlier commencement of cyclicity. Savsani et al. (2013) and Ramteke et al. (2014) have reported a reduced timeframe for the occurrence of the first postpartum heat in buffaloes supplemented with bypass fat compared to those in the control group. Shelke et al. (2012) also reported that reproductive performance is linked to the energy status of the animal. Dietary fats play a significant role in this aspect by providing fatty acid precursors essential for production of cholesterol and prostaglandins. These compounds exert influence on ovarian and uterine function as well as conception rates. Thus, the nutritional composition of diet, particularly its fat content, can have a substantial impact on the reproductive health and success of animals.

Table 4. Feed economics of bypass fat supplementation for lactating buffalo

Particulars	T-1 (Control)	T-2 (<i>Bypass fat</i>)
Av. Milk yield (l/d)	10.19	11.29
Additional increase in milk yield (l /d)	-	1.10
Av. Feeding cost (Rs./ day)	190	207
Additional cost of supplementary feeding (Rs. / day)	-	17
Av. Feeding cost/ lit. milk production (Rs.)	18.65	18.33
Reduction in cost of milk production/ lit. (%)	-	1.75
Gross return from sale of milk (Rs./ day)	611.40	677.40
Additional income from supplementary feeding (Rs./ day)	-	66.00
Net return (Rs./ day)	421.40	470.40
B:C Ratio	3.18	3.27
Additional B:C Ratio from supplementary feeding	-	3.88

A partial budget analysis approach was applied to those incomes and expense elements (Khadda et al., 2023). As a result, the market price of

concentrate, bypass fat and fodder have been taken into account. The family members were used to manage the buffaloes prevalent during the study

period, so, the cost of labor was not taken into account in the computed. The price of used inputs was computation on basis of market price prevalent during the study period. The bypass fat procured from Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana @ Rs. 170/- per kg. Selling price of milk obtained by farmers during the experimental period was taken to be Rs. 60/ lit. The average feeding cost/liter of milk produced in T2 and T1 groups was found to be Rs. 18.33 and Rs. 18.65, respectively, which indicates that, in field conditions, dietary supplementation with bypass fat considerably decreased the cost of producing milk (Table 5). Net return over feed cost of milk yield / day/ animal in T1 and T2 group was found to be Rs. 421.40 and 470.40, respectively. Additional cost and income of supplementary feeding to milch buffalo was found Rs.17.00 and 66.00 day/ buffalo, respectively. Benefit-cost ratio of 1: 3.27 was obtained during the trial period with bypass fat supplementation, which seems to be quite profitable compared to traditional feeding methods.

CONCLUSION

The results indicated that the feeding of bypass fat, improved the milk yield and its composition as well as postpartum reproductive performance in milch buffalo at farmer's field.

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