



Effect of bypass fat supplementation on production performance of lactating Mehsana buffaloes

D A SADRASANIYA¹✉, V K PATEL², S S PATIL³, M M PAWAR³ and K J ANKUYA³

Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat 385 535 India

Received: 8 December 2020; Accepted: 11 November 2021

Keywords: Bypass fat, Feed efficiency, Mehsana buffalo, Milk fat, Milk yield

Dairying is an important activity in Indian economy contributing about 27% of the agricultural GDP which is around 4% of the national GDP (Singh *et al.* 2019). Buffalo population in India is 109.85 million (Livestock Census 2019) and among them, Mehsana is a breed of water buffalo from the state of Gujarat. They are reared for milk production, and are known as one of the best milch breed in India. Nutrition has a significant role in lactation and reproduction performance of livestock animals. Lack of good-quality fodder and inadequate feed resources are the main constraints for livestock productivity in India (Pawar *et al.* 2019). Poor nutrition is one of the major attributes that led to the low productivity of dairy animals. At the onset of parturition as well as during early lactation, the decrease in dry matter intake is common in dairy animals that could limit the potential to produce milk production because of negative energy balance (Delfino *et al.* 2021). This leads to higher fat mobilization to support lactation production, which may further lead to an altered metabolic state which is associated with body weight loss, decreased milk yield and poor fertility. To improve the energy availability to early lactating dairy animals, bypass fats are the alternative sources which may not interfere with the process of fermentation and fiber digestion in the rumen. Recent studies have reported that bypass fat supplementation during early lactation improved milk yield and milk fat percentage in lactating buffaloes (Mobeen *et al.* 2019, Hifzulrahman *et al.* 2020, Rajneesh *et al.* 2021). Moreover, bypass fat supplementation did not alter dry matter intake and reduced negative energy balance in lactating animals (Vala *et al.* 2020, Ranaweera *et al.* 2020). Therefore, the present study was conducted to evaluate the effect of bypass fat supplementation on feed intake, body weight changes, milk yield and composition in lactating Mehsana buffaloes.

Mehsana buffaloes (14) with average milk yield of more

than 10 litres per day and 30 days in lactation were selected and randomly divided into two groups having 7 animals in each group. The animals in the control (CON) group were given basal diet (concentrate mixture, green and dry fodder) to meet the nutrient requirement as ICAR (2013) and the treatment (BPF) group was fed basal diet supplemented with bypass fat at the rate of 100 g/day/animal. The concentrate to roughage ratio was 60:40 maintained through the experiment. The initial and final body weights of experimental animals were measured by using Shaffer's formula. The representative samples of feeds and fodders offered were collected for analysis of dry matter content to find out daily dry matter intake. Buffaloes were milked twice a day and individual milk yield for each buffalo was recorded daily by using electronic weighing balance. Milk samples were collected at weekly interval for analysis of milk fat and solids not-fat (SNF) percentage using auto-milk analyzer. The 6% fat corrected milk (FCM) was calculated by using formula: $6\% \text{ FCM} = (0.4 \times \text{milk yield (kg)} + 15 \times \text{fat yield (kg)})/1.3$.

During the experimental period, dry matter intake was 12.64 ± 0.06 and 12.72 ± 0.04 kg/d in CON and BPF groups, respectively (Table 1). Supplementation of bypass fat did not influence ($P > 0.05$) the DM intake (in terms of kg/d, DMI % of BW and g DMI/BW^{0.75}) in lactating Mehsana buffaloes. Similar to the present findings, recent studies (Ranaweera *et al.* 2020) reported that supplementation of bypass fat below the level of 5% of DM intake did not have adverse effect on DM intake in early lactating dairy animals. On the contrary, Hifzulrahman *et al.* (2020) observed that supplementation of calcium salts of palm fatty acids at the level of 4.8% of the DM intake (600 g/d) decreased DM intake by 0.81% in Nili Ravi buffaloes and Butt *et al.* (2020) observed that the dry matter intake, water intake and rumination number did not significantly differ.

Final body weights of the experimental buffaloes were not affected ($P > 0.05$) due to supplementation of bypass fat. In agreement with the current study, Ranaweera *et al.* (2020) also reported that bypass fat (calcium salt of fatty acids) supplementation had no significant effect on body weight of dairy cows.

Present address: ¹Krishi Vigyan Kendra Deesa. ²Krishi Vigyan Kendra Tharad. ³College of Veterinary Science and Animal Husbandry, Kamdhenu University, Sardarkrushinagar, Gujarat.
✉Corresponding author email: drdevpatel86 @gmail.com

Table 1. Effect of supplementation of bypass fat on dry matter intake and body weight changes in lactating Mehsana buffaloes

Parameter	Treatment		Significance
	CON	BPF	
DMI (kg/d)	12.64±0.06	12.72±0.04	NS
DMI (% of BW)	2.69±0.03	2.72±0.02	NS
DMI/BW ^{0.75} (g)	125.34±1.06	126.51±0.88	NS
Initial BW (kg)	465.86±3.87	462.43±4.41	NS
Final BW (kg)	473.29±2.93	472.86±4.27	NS
Average BW (kg)	469.57±3.31	467.63±3.31	NS

DMI, dry matter intake; BW, body weight; NS, not-significant; CON, basal diet; BPF, basal diet + 100 g/animal/day of bypass fat.

Supplementation of bypass fat resulted in improvement of milk yield and composition in lactating Mehsana buffaloes (Table 2). Significantly higher ($P<0.05$) milk yield and 6% fat corrected milk yield ($P<0.01$) were observed in the BPF group than the CON group. Supplementation of bypass fat resulted in 9.02 and 14.23% increase in milk yield and 6% FCM yield, respectively. The percentages of milk fat (6.43 vs. 6.01%) and SNF (9.51 vs. 9.31%) were significantly ($P<0.05$) higher in the BPF group than the CON group. In the present study, improved production performance in early lactating buffaloes could be due to higher energy intake and the galactopoietic activity of bypass fatty acids in bypass fat supplemented group (Rajneesh *et al.* 2021). Moreover, the increase in milk yield may be related with the ability of bypass fatty acids to alter the glucose metabolism (Hifzulrahman *et al.* 2020). In agreement with the present findings, higher milk yields on supplementation of bypass fat in buffaloes were reported by earlier researchers (Kumar *et al.* 2019, Saxena *et al.* 2019, Hifzulrahman *et al.* 2020, Butt *et al.* 2020, Rajneesh *et al.* 2021). Feed conversion efficiency [DMI (kg)/kg of milk yield] was 1.07±0.02 and 0.98±0.02 in CON and BPF groups, respectively. It was significantly ($P<0.05$) lower in lactating Mehsana buffaloes fed diets supplemented with bypass fat (Table 2). Improved feed conversion efficiency in the present study could be attributed to the higher milk yield without affecting DM intake in lactating buffaloes supplemented with bypass fat.

Based on the findings, it can be concluded that supplementation of bypass fat at the rate of 100 g/d in early lactating Mehsana buffaloes improved the milk yield, 6% fat corrected milk yield, content of milk fat, solids not-fat and feed conversion efficiency. Also, bypass fat supplementation did not have any impact on dry matter intake and body weights of lactating Mehsana buffaloes.

SUMMARY

An on-farm trial was conducted to study the effect of bypass fat supplementation in lactating Mehsana buffaloes for the period of 90 days post-calving in Banaskantha district, Gujarat. Fourteen Mehsana buffaloes were selected and randomly divided into two groups having 7 animals

Table 2. Effect of supplementation of bypass fat on milk yield and composition in lactating Mehsana buffaloes

Parameter	Treatment		Significance
	CON	BPF	
Milk yield (kg/d)	11.86 ^a ±0.29	12.93 ^b ±0.21	*
6% FCM yield (kg/d)	11.87 ^a ±0.32	13.57 ^b ±0.27	**
Milk fat (%)	6.01 ^a ±0.12	6.43 ^b ±0.09	*
Milk SNF (%)	9.31 ^a ±0.06	9.51 ^b ±0.04	*
Total (90 d) milk yield (kg)/animal	1067.4	1163.7	—
Total (90 d) FCM yield (kg)/animal	1238.4	1332.9	—
% increase in milk yield	—	9.02	—
% increase in FCM yield	—	14.23	—
Projected increase milk yield (kg)/animals in 305 days	—	326.35	—
Feed conversion efficiency			
DMI (kg)/kg of milk yield	1.07±0.02	0.98±0.02	*

^{a,b}Values in a row with different superscripts differed significantly (* $P<0.05$; ** $P<0.01$); CON, Basal diet; BPF, Basal diet + 100 g/animal/day of bypass fat.

each. The animals in the control (CON) group were fed on basal diet (concentrate mixture, green and dry fodder) and the treatment (BPF) group was fed basal diet supplemented with bypass fat @ 100 g/day/animal. Supplementation of bypass fat did not influence the DM intake and body weights. Higher milk yield (9.02%) and 6% fat corrected milk yield (14.23%) were observed in the BPF than the CON group. The percentages of milk fat (6.43 vs. 6.01%) and SNF (9.51 vs. 9.31%) were significantly higher in the BPF than the CON group. The feed conversion efficiency was significantly lower (0.99 vs. 1.07) in bypass fat fed group. Based on the findings, it was concluded that supplementation of bypass fat at the rate of 100 g/d in early lactating Mehsana buffaloes improved the milk yield, FCM yield, milk fat content, SNF and feed conversion efficiency.

ACKNOWLEDGEMENTS

The authors acknowledge the facilities and financial support provided by ICAR, New Delhi and Director of Extension Education, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat.

REFERENCES

- Butt J H, Konwar D, Brahma B, Khan A and Sharma R K. 2020. Effect of bypass fat supplementation on performances in crossbred cattle during winter season. *Indian Journal of Animal Health* **59**: 78–84.
- Delfino N C, Silva R D, Alba H D, Oliveira M X, Carvalho G G, Araújo M L, Pina D D and Freitas Júnior J E. 2021. Milk yield and composition, blood, and urinary parameters of Murrah buffaloes in different maturity stages during the transition period and early lactation. *Journal of Applied Animal Research* **49**: 247–56.

- Hifzulrahman A M, Akhtar M U, Bhatti J A, Saadullah M and Naveed-ul-Haque M. 2020. Effects of feeding calcium salts of palm fatty acids on lactation and reproduction performance in Nili Ravi buffaloes. *Pakistan Journal of Zoology* **52**: 1631–36.
- ICAR. 2013. *Nutrient Requirements of Cattle and Buffalo*. Indian Council of Agricultural Research, New Delhi, India.
- Kumar R, Nayak S, Baghel R P S, Malapure C D and Roy B. 2019. Consequence of prill fat and rumen protected choline supplementation on milk yield and its makeup in Murrah buffaloes. *Buffalo Bulletin* **38**: 49–56.
- Livestock Census (2019). Government of India, 20th Livestock Census-2019. Ministry of Fisheries, Animal Husbandry & Dairying; Department of Animal Husbandry and Dairying, Krishi Bhawan, New Delhi, India. <http://dadf.gov.in/sites/default/files/Key%20Results%2BAnnexure%2018.10.2019.pdf>
- Mobeen A, Riaz M, Raza S H, Sharif M and Yaqoob M U. 2019. Effect of bypass fat supplementation on milk yield in lactating cows and buffaloes. *Pakistan Journal of Agricultural Sciences* **56**: 743–46.
- Pawar M M, Ashwar B K, Joshi P C, Patil S S, Madhavatar M P, Thakkar N K, Patel J V and Gupta J P. 2019. Constraints perceived about fodder production by the dairy farmers of north Gujarat. *Indian Journal of Dairy Science* **72**: 565–68.
- Rajneesh, Misra A K, Sharma R and Chauhan P. 2021. Effect of bypass fatty acid and *Tinospora cordifolia* supplementation on production performance and milk fatty acid profiling in Murrah buffaloes (*Bubalus bubalis*). *Tropical Animal Health and Production* **53**: 1–1.
- Ranaweera K K T N, Mahipala M K and Weerasinghe W M P B. 2020. Influence of rumen bypass fat supplementation during early lactation in tropical crossbred dairy cattle. *Tropical Animal Health and Production* **52**: 1403–11.
- Saxena N, Mohan C, Sreehari S, Sharma M L, Kumar K, Mudgal V and Lal D. 2019. Effect of bypass fat supplementation on productive and reproductive performance in Murrah buffaloes (*Bubalus bubalis*). *Ruminant Science* **8**: 177–80.
- Singh S R, Thakar K P, Soumya C and Datta K K. 2019. Future of smallholders in the dairy sector: A macro study of Gujarat. *Indian Journal of Dairy Science* **72**: 534–41.
- Vala K B, Dhami A J, Kavani F S, Bhandari B B and Parmar S C. 2020. Impact of peripartum nutritional supplementation on thyroid hormones, metabolites and reproductive peridata in Jafarabadi buffaloes. *Indian Journal of Veterinary Sciences and Biotechnology* **15**: 16–20.