DR-1910
[1-4]

RESEARCH ARTICLE Asian Journal of Dairy and Food Research, Volume Issue : ()

Effect of Supplementation of Rumen Bypass Fat on Live Body Weight, Milk Yield, Milk Composition and Body Condition Score of Graded Murrah Buffaloes

P.V. Patil, V.M. Salunke, M.K. Patil, S.S. Ghoke

10.18805/ajdfr.DR-1910

ABSTRACT

Background: During early lactation, the nutrient requirement of cows and buffaloes will be increased and at the same time, the feed intake is lowered due to stress of parturition. During this condition, depletion of body nutrient store occurs and the animal becomes weak day by day due to negative energy balance. Therefore to overcome the negative energy balance due to low feed intake, an alternate energy-dense ingredient is required. The bypass fat overcomes the negative energy balance and maintains animal body weight as well as milk production. Hence, undertook the present investigation.

Methods: The present research was carried out in 10 graded Murrah buffaloes to study the effect of supplementation of rumen bypass fat on live body weight, milk yield, milk composition and body condition score during early lactation. The body weight, milk yield, milk composition and body condition score were recorded at weekly intervals before and after supplementation of rumen bypass fat.

Result: Highly significant increase in live body weight, body condition score and milk production was observed, whereas a non-significant to a significant increase in milk fat and protein was recorded. The present study found a significant decrease in milk SNF and a highly significant decrease in milk density percentage. Non-significant effect on milk lactose was recorded. Therefore, it is concluded that supplementation of bypass fat could improve live body weight, body condition score and milk production in graded Murrah buffaloes.

Key words: Body weight, Body condition score, Milk composition, Milk yield, Rumen bypass fat.

INTRODUCTION

During early lactation, the amount of energy required maintaining body tissues and milk production often exceeds the amount of energy available from the diet (Goff and Horst, 1997). Rising milk yield during early lactation presents a feeding problem in dairy cows as the peak milk yield occurs at 6 to 8 weeks postpartum, whereas the maximum feed intake lags behind peak milk yield by several weeks. In early lactation, to maintain high milk yield he dairy animals use their body reserves as an energy source to support high milk yield therefore, it is essential to store adequate amounts of nutrients in body tissues during late lactation. In early lactation, continuously rising milk yield increases energy deficit (Alapati *et al*., 2022). Energy demand is very high during an early stage of lactation, but intake does not commensurate with demand, thus affecting animal production potential (Sirohi *et al*., 2010). Hence, during early lactation, dairy animals are often forced to draw on body reserves to satisfy energy requirements, thereby substantially losing body weight, which adversely affects production, resulting in lower yield (Kim *et al*., 1993).

Including unprotected fat in the dairy ration above 3% of dry matter (DM) intake reduces DM and fibre digestibility (NRC, 2001). Besides, unprotected fat reduces rumen cellulolytic microbial activity (Ranjan *et al*., 2012).

Additional fat in the form of bypass fat supplies more energy to the animal for more milk synthesis after being digested in abomasums and small intestine with absorption from the small intestine without interfering with the rumen fermentation. Supplementation of bypass fat helps increase unsaturated fatty acids in milk, resulting in softer butter and safer milk for human consumption, especially for heart patients (Bobe *et al*., 2007, Garg *et al*., 2008).

It is stated that supplementing ration of lactating animals with bypass fat enhances energy intake in early lactation, reducing the harmful effect of acute negative energy balance on lactation (Tyagi *et al*., 2010). Therefore, undertook the present work to study the impact of supplementing rumen bypass fat on live body weight, body condition score, milk yield and composition in graded Murrah buffaloes during early lactation.

Livestock Farm Complex, College of Veterinary and Animal Sciences, Udgir-413 517, Latur, Maharashtra, India.

Corresponding Author: P.V. Patil, Livestock Farm Complex, College of Veterinary and Animal Sciences, Udgir-413 517, Latur, Maharashtra, India. Email: drpv9ann@gmail.com

How to cite this article: Patil, P.V., Salunke, V.M., Patil, M.K. and Ghoke, S.S. (2022). Effect of Supplementation of Rumen Bypass Fat on Live Body Weight, Milk Yield, Milk Composition and Body Condition Score of Graded Murrah Buffaloes. Asian Journal of Dairy and Food Research. DOI: 0.18805/ajdfr.DR-1910.

Submitted: 09-03-2022 **Accepted:** 22-06-2022 **Online:** 20-07-2022

MATERIALS AND METHODS

The trial was conducted at Livestock Farm Complex, College of Veterinary and Animal Sciences, Udgir dist. Latur (Maharashtra) in the year 2020. Ten graded Murrah buffaloes were selected for this study. All graded Murrah buffaloes were examined clinically for good health status. Optimum health score condition and good managemental care were confirmed in each animal before including it in the trial. The animals were subjected to identical housing and management conditions. The experimental animals were offered *ad-libitum* DHN 6 green fodder and 4 Kg of *kadbi* to each buffalo. The feed ingredients and fodder provided to them were unchanged during the trial period. The live body weight, milk composition and body condition score were recorded weekly and daily milk yield was recorded before and after rumen bypass fat supplementation to graded Murrah buffaloes. Rumen Bypass fat was offered @ 50 grams once a day/animal. Bypass fat was mixed in a concentrate mixture uniformly in the morning and fed individually to each animal. The trial was conducted for 84 days. Milk composition was analyzed on a Milkoscan milk analyzer. The live body weight was recorded on digital platform balance. Each buffalo's weekly body condition score was recorded by looking at and handling the backbone, loin and rump areas for the amount of fat deposition. The data were analyzed by using paired T-test as per Snedecor and Cochran (1994).

The chemical composition of concentrate mixture is depicted in Table 1.

RESULTS AND DISCUSSION

Average values of weekly body weight, body condition score, milk yield and milk composition were presented in Table 2. Weekly live body weight was found significantly ($p<0.05$) increased from the second week of supplementation and was increased up to the 10th week of rumen bypass supplementation. The Average weekly live body weights ranged from 391.05±24.43 to 413.43±96 kg.

This finding is in agreement with Wadhwa *et al*. (2012); Puroshothaman *et al*. (2008) and Naik *et al.* (2009).

The weekly body condition score, which ranged from 2.71±0.07 to 3.58±0.08 and was also found to be increased significantly ($p<0.05$) from the second week and a highly significant ($p<0.05$) increase in body condition score was observed up to the 11th week of the study period. Similar observations were recorded by Ganjkhanlou *et al*. (2009) and Naik *et al*. (2009)

Highly significant ($p<0.05$) rise in milk yield during supplementation of rumen bypass fat was observed than the average daily milk yield before supplementation of rumen bypass fat to graded Murrah buffaloes. The average daily milk yield ranges from 4.15±0.43^{a} to 5.35±0.42 liters/day. An increase in milk yield after supplementation of bypass fat was reported by Barley and Baghel (2009); Hundal *et al*. (2020) and Rohila *et al*. (2016), whereas Mudgal *et al*. (2012) reported no effect on milk yield of the crossbred cows on feeding bypass fat at late lactation.

Shelke *et al*. (2012) opined that improvement in whole milk yield is due to higher ME intake observed in this group due to fortifying the diet with rumen-protected fat.

Data from Table 2 indicated a non-significant difference between milk fat content before and after supplementation of rumen bypass fat up to the 7th week of supplementation. A statistically significant ($p<0.05$) increase in milk fat percentage was observed from the 8th week up to the 11th week of supplementation.

Rohila *et al.* (2016) and Sharda Kumari *et al*. (2018) reported increased milk fat content by supplementation bypass fat to Murrah buffaloes and crossbred cows. The probable reason for increased milk fat percentage might be the linear relationship between dietary, plasma and milk FA (Sarwar *et al*., 2003). Another reason for increased milk fat percentage was that increased dietary fat enhanced supply of fatty acids to the mammary gland from feed, which resulted in a lower proportion of denovo fat synthesis.

A significant ($p<0.05$) decrease in milk SNF (Solids not fat) was observed from the second week of rumen bypass fat supplementation upto the 11th week of supplementation except 4th and 5th week of supplementation. Here, the decrease in milk SNF might be due to a significant increase in milk yield after bypass fat supplementation to buffaloes. Rohila *et al*. (2016) reported a non-significant difference in SNF content of buffalo milk before and after supplementation of bypass fat.

A significant to highly significant ($p<0.05$) decrease in milk density was recorded after the whole supplementation period of 84 days. The milk density percentage was decreased from 33.32±0.57 to 30.35±0.23. An increase in total solids in milk after supplementation of bypass fat to Murrah buffaloes was reported by Rohila *et al*. (2016).

Data on milk protein content indicated that the milk protein percentage was significantly ($p<0.05$) increased during the 1st, 2nd, 3rd, 4th, 7^{th,} 8th and 9th week of rumen bypass fat supplementation. The non-significant difference was observed in milk protein percentage on the 5th, 6th, 10th and 11th week of study before and after supplementation of rumen bypass fat to graded Murrah buffaloes. The milk protein percentage in this study ranged from 2.80±0.17 to 3.17±0.07. The improvement in milk protein content might be due to better utilization of feed proteins due to better energy to protein ratio after supplementation of bypass fat. The non-significant difference in milk protein content before and after

Table 1: Composition of Concentrate mixture offered to experimental animals.

Name of ingredient	Percentage
Ground maize	50
Cotton seed cake	30
Arhar Chuni	17
Mineral mixture	02
Salt	01

Table 2: Effect of supplementation of rumen bypass fat on weekly live body weight, body condition score, milk yield and milk composition.

Week	Before supplementation	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
		After Supplemention										
Weekly body weight	391.05±24.43^{a}	392.47±24.06^{a}	393.75±23.81^{b}	396.50±23.71^{c}	398.72±23.74^{c}	401.27±23.80^{d}	403.78±24.10^{d}	405.88±23.97^{d}	409.68±24.53^{e}	412.13±24.22^{e}	413.43±96^{e}	409.28±25.55^{e}
Weekly body condition score	2.71±0.07^{a}	2.79±0.07^{a}	2.88±0.08^{b}	3.00±0.06^{c}	3.04±0.07^{c}	3.08±0.05^{c}	3.21±0.04^{d}	3.29±0.07^{d}	3.33±0.08^{d}	3.42±0.05^{e}	3.50±0.09^{e}	3.58±0.08^{e}
Milk yield (lits.)	4.15±0.43^{a}	4.58±0.41^{b}	4.87±0.41^{c}	5.02±0.42^{c}	5.12±0.43^{c}	5.20±0.42^{d}	5.27±0.41^{d}	5.35±0.42^{e}	5.27±0.42^{d}	5.30±0.44^{d}	5.25±0.41^{d}	5.32±0.44^{d}
Fat percentage	7.79±0.31^{a}	8.11±0.17^{a}	8.13±0.17^{a}	8.11±0.18^{a}	8.14±0.17^{a}	8.14±0.17^{a}	8.14±0.18^{a}	8.15±0.19^{a}	8.17±0.20^{b}	8.17±0.19^{b}	8.20±0.20^{b}	8.18±0.20^{b}
SNF percentage	9.69±0.20^{b}	9.54±0.11^{b}	9.49±0.13^{a}	9.51±0.14^{a}	9.50±0.12^{a}	9.49±0.12^{a}	9.48±0.13^{a}	9.48±0.13^{a}	9.46±0.12^{a}	9.47±0.12^{a}	9.47±0.13^{a}	9.46±0.12^{a}
Milk density percentage	33.32±0.57^{b}	31.55±0.31^{a}	31.19±0.43^{a}	31.55±0.48^{a}	31.28±0.42^{a}	30.53±0.25^{a}	30.54±0.24^{a}	30.49±0.25^{a}	30.42±0.25^{a}	30.42±0.24^{a}	30.37±0.24^{a}	30.35±0.23^{a}
Milk protein percentage	2.80±0.17^{a}	3.13±0.08^{b}	3.12±0.10^{b}	3.16±0.07^{b}	3.17±0.07^{b}	3.13±0.05^{b}	3.14±0.03^{b}	3.14±0.05^{b}	3.17±0.04^{b}	3.17±0.05^{b}	3.15±0.05^{b}	3.15±0.05^{b}
Milk lactose percentage	5.32±0.12^{a}	5.41±0.13^{a}	5.16±0.06^{a}	5.26±0.06^{a}	5.23±0.05^{a}	5.00±0.02^{a}	5.00±0.03^{a}	5.00±0.02^{a}	4.96±0.02^{a}	4.98±0.01^{a}	4.96±0.02^{a}	4.94±0.03^{a}

supplementation of bypass fat to Murrah buffaloes was recorded by Rohila *et al.* (2016).

Milk fat, protein, yield and mean body condition scores increased linearly with increased fat saturation (Pantoja *et al*., 1996).

A non-significant difference ($p<0.05$) was observed in milk lactose content before and after supplementation of rumen bypass fat to graded Murrah buffaloes.

CONCLUSION

Based on observations found in this study, it was concluded that an increase in live body weight, body condition score and milk production was observed after supplementation of rumen bypass fat to lactating graded Murrah buffaloes, whereas non-significant to a significant increase in milk fat and milk protein was recorded. Supplementation of bypass fat leads to a decrease in milk SNF and milk density percentage. There was no effect of supplementation of rumen bypass fat found on milk lactose.

Conflict of interest: None.

REFERENCES

Alapati, A., Kapa, S.R. and Jeepalyam, S. (2022). Effect of body condition score at calving on postpartum performance of Murrah buffaloes. Indian Journal of Animal Research. DOI: 10.18805/IJAR.B-4795.

Barley, G.G. and Baghel, R.P.S. (2009). Effect of bypass fat supplementation on milk yield, fat content and serum triglyceride levels of murrah buffaloes. Buffalo Bulletin. 28(4): 173-175.

Bobe, G., Zimmerman, S., Hammond, E.G., Freeman, A.E., Porter, P.A., Luhman, C.M. and Beitz, D.C. (2007). Butter composition and texture from cows with different milk fatty acid compositions fed fish oil or roasted soybeans. Journal of Dairy Science. 90: 2596-2603.

Ganjkhanlou, M., Rezayazdi, K.., Ghorbani, G.R., Banadaky, H.D., Morraveg, H., Yang, W.Z. (2009). Effects of protected fat supplements on production of early lactation Holstein cows. Animal Feed Science and Technology. 154: 276-283.

Garg, M.R., Sherasia, P.L., Bhanderi, B.M., Gulati, S.K. and Scott, T.W. (2008). Effect of feeding bypass fat supplement on milk production and characteristics of butter fat. Indian Journal of Dairy Science. 61(1): 56-61.

Goff, J.P. and Horst, R.L. (1997). Physiological changes at parturition and their relationship to metabolic disorders. Journal of Dairy Science. 80(1): 260-268.

Hundal, J.S., Wadhwa, M., Veena, N. and Puniya, A.K. (2020). Effect of bypass nutrients on fatty acid composition, Reichert Meissl and Polenske value of cow milk fat. Indian Journal of Animal Research. 54(12): 1512-1516.

Kim, Y.K., Schingoethe, D.J., Casper, D.P., Ludens, F.C. (1993). Supplemental dietary fat from extruded soybeans and calcium soaps of fatty acids for lactating dairy cows. Journal of Dairy Science. 76: 197-204.

Mudgal, V., Baghel, R.P.S., Ganie, A. and Srivastava, S. (2012). Effect of feeding bypass fat on intake and production performance of lactating crossbred cows. Indian Journal of Animal Research. 46: 103-104.

Naik, P.K., Saijpaul, S., Sirohi, A.S., Raquib, M. (2009). Lactation response of cross bred dairy cows fed indigenously prepared rumen protected fat - A field trial. Indian Journal of Animal Science. 79: 1045-1049.

NRC. (2001). Nutrient Requirements of Dairy Cattle. 7th Ed. National Academy Press, Washington, DC, USA, 2001.

Pantoja, J., Firkins, J.L., Eastridge, M.L., Hull, B.L. (1996). Fatty acid digestion in lactating dairy cows fed fats varying in degree of saturation and different fiber sources. Journal of Dairy Science. 79: 575.

Purushothaman, S., Kumar, A., Tiwari, D.P. (2008). Effect of feeding calcium salts of palm oil fatty acids on performance of lactating crossbred cows. Asian-Australian Journal of Animal Sciences. 13(21): 376-385.

Ranjan, A., Sahoo, B., Singh, V.K., Srivastava, S., Singh, S.P., Pattanaik, A.K. (2012). Effect of bypass fat supplementation on productive performance and blood biochemical profile in lactating Murrah (*Bubalus bubalis*) buffaloes. Tropical Animal Health and Production. 44(7): 1615-1621. https://doi.org/10.1007/s11250-012-0115-3.

Rohila, H., Chhikara, S.K., Sihag, S., Dhiman, D., Kumar, R., Kumar, R., Nagar, V. (2016). Effect of bypass fat supplementation on milk yield, milk fat, milk protein, solid not fat and total solid in lactating Murrah buffaloes. Haryana Veterinarian. 55(2): 192-194.

Sarwar, M., Sohaib, A., Khan, M.A., Mahr-un-Nisa. (2003). Effect of feeding saturated fat on milk production and composition in crossbred dairy cows. Asian-Australian Journal of Animal Sciences. 16(2): 204-210.

Sharda Kumari, Dharmendra Kumar, Sanjay Kumar Mandal and Raghubar Sahu. (2018). Effect of feeding bypass fat on milk yield, composition, efficiency of nutrients and economics in cross bred cow: A field trial. International Journal of Current Microbiology and Applied Science, Special Issue-7: 3095-3102.

Shelke, S.K., Thakur, S.S., Amrutkar, S.A. (2012). Effect of feeding protected fat and proteins on milk production, composition and nutrient utilization in Murrah buffaloes (Bubalus bubalus). Animal Feed Science and Technology. 171: 98-107.

Sirohi, S.K., Wali, T.K., Mohanta, R. (2010). Supplementation effect of bypass fat on production performance of lactating crossbred cow. Indian Journal of Animal Sciences. 80: 733-736.

Snedecor, G.W. and Cochran, W.G. (1994). Statistical Methods. 8th ed., Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India.

Tyagi, N., Thakur, S.S., Shelke, S.K. (2010). Effect of bypass fat supplementation on productive and reproductive performance in crossbred cows. Tropical Animal Health and Production. 42: 1749-1755.

Wadhwa, M., Grewal, R.S., Bakshi, M.P.S., Brar, P.S. (2012). Effect of supplementing bypass fat on the performance of high yielding crossbred cows. Indian Journal of Animal Sciences. 82: 200-203.