Journal of Animal Research: v.7 n.2, p. 355-359. April 2017

DOI: 10.5958/2277-940X.2017.00051.1

Effect of Prill Fat and Rumen Protected Choline Supplementation on Feed Intake, Body Weight Changes and Economics of Lactating Murrah Buffaloes

Rajesh Kumar[1], Sunil Nayak[1]*, R.P.S. Baghel[1], Chandrashekhar D. Malapure[1], Ashok Kumar Patil[1] and Ankit Kumar Singh[2]

[1]Department of Animal Nutrition, College of Veterinary Science & Animal Husbandry, Jabalpur, Madhya Pradesh, INDIA
[2]Department of Veterinary Pharmacology and Toxicology, College of Veterinary Science and Animal Husbandry, Jabalpur, Madhya Pradesh, INDIA

**Corresponding author: S Nayak; Email: sunilnayak91@yahoo.com*

Received: 31 Dec., 2016 **Revised:** 04 Feb., 2017 **Accepted:** 06 Feb., 2017

ABSTRACT

The present study was carried out to evaluate the effect of prill fat and rumen protected choline supplementation on daily dry matter intake, body weight changes and economics in lactating Murrah buffaloes (n=18) divided into three equal groups (Control, T_1 and T_2). Buffaloes in all the three groups were fed similar basal diet as total mixed ration comprising of berseem green fodder, wheat straw and concentrate mixture. Buffaloes in T_1 group were daily supplemented with prill fat @ 2.5% of total DMI whereas; buffaloes in T_2 group were daily supplemented with 54 g rumen protected choline along with same quantity of prill fat as supplemented in T_1 group. Fortnightly and overall dry matter intake and body weight of experimental buffaloes was comparable in all the three groups. Net profit/animal/day (₹) was increased by 3.12 and 8.25% in T_1 and T_2 groups over the control. Thus it was concluded that supplementing prill fat in the ration of lactating Murrah buffaloes increased the net profit without any significant effect on dry matter intake and body weight changes, which was furthermore enhanced by supplementing the ration with rumen protected choline.

Keywords: Buffaloes, dry matter, economics, prill fat, rumen protected choline

Energy is the most important constraint in diet of lactating animals. Usually, ration of high yielding buffaloes during early lactation is energy deficient as the animals are fed limited quantity of cultivated fodder and energy rich supplements, thus forcing the mobilization of body fat reserves to satisfy their energy requirement. As a result, animals loose body weight after calving at a faster rate. The level of non-esterified fatty acids (NEFA) increases in plasma as a consequence of body fat mobilization and leads to hepatic lipidosis.

Due to depressed feed intake at the end of gestation, animal get into negative energy balance often prior to calving. The negative energy balance in early lactation affects performance of the animals (Garnsworthy and Webb, 1999). Overall, it is a significant economic loss to milk producers on account of less milk production.

Fat as energy source if incorporated in diet of ruminants at higher levels disturbs normal rumen metabolism of the animal which affect both quantity and quality of animal production (Zened *et al*., 2013). Prill fat is a non-hydrogenated vegetable oil and contains more than 85% palmitic acid with high melting point. Due to this reason, it does not melt at low pH, by passes rumen degradation and is digested in small intestine by lipase enzyme. Thus, total supplemented energy in diet of a lactating animal become available for the productive purposes (Singh *et al*., 2014)

Choline, a component of phospholipid and methyl donor, plays an essential role in very low density lipoprotein synthesis and thereby contributes to fat export from the liver. Fat metabolism can be improved with the help of choline for better energy production which also helps in improving milk production. Evidence suggests that the

dietary supply of choline in early lactating dairy animals may be inadequate, even though choline can be synthesized by the animals (Pires and Grummer, 2008). As dietary choline gets degraded rapidly in the rumen, therefore, rumen protected form of choline has been developed which makes it available for absorption at small intestine (Garg *et al*., 2012a).

Considering the fact that the supplementation of prill fat and rumen protected choline could increase the economic return to the farmers by increasing milk production, present study was planned with aim to investigate the effect of prill fat and rumen protected choline supplementation on dry matter intake, body weight changes and economics of lactating Murrah buffaloes.

MATERIALS AND METHODS

The study was carried out at the Livestock Farm, Adhartal, College of Veterinary Science and Animal Husbandry, Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh, India.

Experimental design and dietary treatments

Eighteen Murrah buffaloes were divided into three groups (Control, T_1 and T_2) having six buffaloes in each, based on the level of milk production, fat %, and stage of lactation (2-3 weeks post-partum). During the experimental period of 90 days, buffaloes in all the three groups were fed similar basal diet as total mixed ration, comprising of berseem green fodder, wheat straw and concentrate mixture to meet the requirements for maintenance and milk production (Kearl, 1982). Proximate composition (% DM basis) of feed/fodders used in experiment is presented in Table 1. Basal diet of buffaloes in T_1 group was supplemented with prill fat @ 2.5% of DM while, basal diet of buffaloes in T_2 group was daily supplemented with 54 g commercially available rumen protected choline along with same quantity of prill fat supplemented in T_1 group.

All the experimental buffaloes were housed in a well-ventilated shed having cemented floor with individual feeding and watering arrangement. The buffaloes were dewormed before the start of the experiment and standard managemental practices were followed in the shed. *Ad-libitum* clean and fresh water was made available to the buffaloes during the experiment.

Table 1: Proximate composition (% DM basis) of feed/ fodders used in the experiment

Feeds/Fodder	DM	CP	EE	CF	NFE	TA
Concentrate mixture	90.89	20.25	04.81	09.35	59.46	06.12
Wheat straw	89.35	03.30	01.10	38.48	47.24	09.88
Berseem fodder	20.00	15.80	01.40	28.50	38.30	16.00

DM= Dry matter, CP= Crude protein, EE= Ether Extract, CF= Crude fibre, NFE= Nitrogen free extract, TA= Total Ash

Parameters studied

Amount of feed offered and residue from all the experimental buffaloes in different groups were weighed daily and sampled at weekly intervals for subsequent analysis of dry matter (DM) to assess daily dry matter intake. Body weights of all the buffaloes under different groups were recorded using electronic weighing balance at the start and at completion of the experiment. Economics of milk production was calculated at the end of experiment based on the expenditure on feeds and supplements; and return from the milk production of buffaloes.

Statistical analysis

The statistical analysis of the data was performed using SPSS computer package (SPSS version 20.0, SPSS Inc., Chicago, USA) adopting standard statistical procedures (Snedecor and Cochran, 2004).

RESULTS AND DISCUSSION

Dry matter intake (DMI) and body weight changes

The fortnightly and overall average daily dry matter intake of control, T_1 and T_2 groups are depicted in the Table 2.

Analysis of variance revealed that fortnightly and overall dry matter intake (kg) of buffaloes was numerically increased in group T_2 followed by T_1 as compared to control but the difference remained non-significant. Overall dry matter intake per 100 kg BW or per kg metabolic body size was also statistically similar ($P>0.05$) in all the three groups. The non-significant effect of prill fat on DMI in supplemented group is in line with earlier findings of various researchers who reported no change in DMI of

cows during early and mid-lactation after supplementing prill fat in their basal ration (Thakur and Shelke, 2010; Silvestre *et al*., 2011; Singh *et al*., 2014).

Table 2: Fortnightly and overall average daily dry matter intake (kg/d) of Murrah buffaloes

Fortnights	Control	T_1	T_2	SEM	P Value
1	13.32±0.45	13.44±0.40	13.61±0.42	0.23	0.89
2	13.81±0.44	14.42±0.40	14.96±0.42	0.25	0.19
3	14.18±0.34	14.92±0.88	15.48±0.95	0.44	0.50
4	14.62±0.61	15.54±0.60	16.11±0.83	0.40	0.33
5	14.99±0.66	15.95±0.70	16.48±0.81	0.42	0.37
6	15.02±0.72	16.00±0.94	16.65±0.85	0.49	0.41
Overall DMI	14.32±0.38	15.04±0.45	15.54±0.54	0.28	0.20
Overall DMI (kg)/100 kg BW	2.81±0.12	2.93±0.17	2.98±0.11	0.08	0.66
Overall DMI (kg)/ kg $W^{0.75}$	0.13±0.00	0.14±0.01	0.14±0.00	0.00	0.36

Garg *et al*. (2012a) and Garg *et al*. (2012b) reported non-significant change in dry matter intake of Jaffarabadi buffaloes and crossbred cows after supplementation of either prill fat either alone or along with choline when compared to non-supplemented control group, however levels of prill fat (100 g/d in cow; 150 g/d in buffaloes) and protected choline (10 g/d for cow; 15 g/d for buffalo) used by them were quite lower than the levels used in present study.

Prill fat supplementation augmented milk secretion of cows without affecting dry matter intake significantly (Rajesh *et al*. 2014). Average body weights (kg) of buffaloes at the end of experiment were not influenced by supplementation of prill fat either alone or in combination with protected choline (Table 3). However, losses in body weights of buffaloes under control group were higher (3.23%) during the study but recovery from body weight losses was better (1.94 and 1.58%) in supplemental T_1 and T_2 groups indicating thereby that some of the additional energy intake by cows fed prill fat supplemented diets may have contributed to preventing BW loss, which is often seen during early lactation (Ganjkhanlou *et al*., 2009).

Table 3: Mean body weight (kg) of Murrah buffaloes in different groups

Duration	Control	T_1	T_2	SEM	P value
0 Day (Initial)	521.00 ± 14.34	524.00 ± 23.28	526.50 ± 12.72	9.46	0.98
90^{th} Day (Final)	504.17 ± 13.12	513.83 ± 23.91	518.17 ± 13.51	9.64	0.85

In support to our results, non-significant effect of supplemental calcium long chain fatty acids (Ca-LCFA) on BW changes in dairy cows was reported by Tyagi *et al*. (2009) however, recovery of BW losses was better in Ca-LCFA supplemented cows during early lactation as compared to non-supplemented cows. Observations regarding non significant effect of rumen protected choline on body weight of animals are in accordance with Zom *et al*. (2011) who reported no change in body weight of peripatuirent cows after supplementing rumen protected choline in their diet.

Economics

Economics of prill fat and rumen protected choline supplemented Murrah buffaloes in control, T_1 and T_2 group is presented in Table 4.

Table 4: Economics of prill fat and rumen protected choline supplemented Murrah buffaloes

Attributes	Control	T_1	T_2
Cost of concentrate/ animal/ day (₹)	77.71	82.48	87.59
Cost of dry roughage/ animal/ day (₹)	30.15	30.54	30.87
Cost of green roughage/ animal/ day (₹)	32.00	30.50	31.00
Cost of prill fat/ animal/ day (₹)	Nil	33.75	34.81
Cost of choline/ animal/ day (₹)	Nil	Nil	16.84
Total feed cost/ animal/ day (₹)	139.86	177.27	201.11
Average milk yield/ animal/ day (kg)	08.18	09.17	09.96
Returns from milk produced/ animal/ day (₹)	368.10	412.65	448.20
Cost of feed/kg milk produced/ animal/ day (₹)	17.09	19.33	20.19
Net profit/ animal/ day (₹)	228.24	235.38	247.09

*Feeds cost (₹/kg); Concentrate:17.99, Dry Roughage: 3.47, Green Roughage: 2.00, Prill Fat: 90.00, Choline: 312.00; Milk Cost (₹./ kg): 45.00

Total feed cost (₹) per animal per day was increased in group T_2 followed by T_1 as compared to control due to increased cost of supplementation. Overall average milk production was highest in T_2 group followed by T_1 and control so the returns from milk yield. Cost of feed (₹) per kg milk produced per animal per day was also higher in T_2 group followed by T_1 and control. Net profit/animal/day (₹) was increased by 3.12 and 8.25% due to added income of ₹ 7.14 and 18.85 in T_1 and T_2 group over the non-supplemented control group which is attributed to higher milk yield in supplemented groups. These findings are in harmony with Yadav *et al*. (2015) who reported that the supplementation of prill fat in the ration of crossbreed cows was economical and resulted in an additional income generation of ₹ 94.46/cow/day. Results regarding higher net profit in prill fat supplemented group as compared to non-supplemented group are also in accordance with Naik *et al.* (2009); Gowda *et al*. (2013) and Singh *et al.* (2014). In Support to our results, Mohsen *et al*. (2011) also reported higher net profit in rumen protected choline (RPC) supplemented animals.

CONCLUSION

From the results of present study it was concluded that supplementing prill fat in the ration of lactating Murrah buffaloes increased the net profit without any significant effect on dry matter intake and body weight changes, which was furthermore enhanced by supplementing the ration with rumen protected choline.

ACKNOWLEDGEMENTS

The authors are thankful to The Dean, Collage of Veterinary Science and Animal Husbandry, Jabalpur, Madhya Pradesh, India for providing support and necessary laboratory facilities to carry out this research.

REFERENCES

Ganjkhanlou, M., Rezayazdi, K., Ghorbani, G.R., Dehghan Banadaky, M., Morraveg, H., Yang, W.Z. 2009. Effects of protected fat supplements on production of early lactation Holstein cows. *Anim. Feed Sci. Technol*., **154**: 276-283.

Garg, M.R., Bhanderi, B.M. and Sherasia, P.L. 2012a. Effect of supplementing bypass fat with rumen protected choline chloride on milk yield, serum lipid profile in Jaffarabadi buffaloes. *Buffalo Bull.*, **31**: 91-98.

Garg, M.R., Bhanderi, B.M. and Sherasia, P.L. 2012b. Effect of supplementing bypass fat with rumen protected choline chloride on milk yield, milk composition and metabolic profile in crossbred cows. *Indian J. Dairy Sci*., **65**: 319-323.

Garnsworthy, P.C. and Webb, R. 1999. The influence of nutrition on fertility in dairy cows. In: Recent advances in animal nutrition. (Eds) Garnsworthy, P.C. and Nottingham, W.J. University Press, UK. pp. 39-57.

Gowda, N.K.S., Manegar, A., Raghavendra, A., Verma, S., Maya, G., Pal, D.T., Suresh, K.P. and Sampath, K.T. 2013. Effect of protected fat supplementation to high yielding dairy cows in field condition. *Anim. Nutr. Feed Technol*., **13**: 125-130.

Kearl, L.C. 1982. Nutrient requirements of ruminants in developing countries. International Feedstuffs Institute, Utah Agricultural Experiment Station, Utah State University, Logan, Utah, USA.

Mohsen, M.K., Gaafar, H.M.A., Khalafalla, M.M., Shitta, A.A. and Yousif, A.M. 2011. Effect of rumen protected choline supplementation on digestibility, rumen activity and milk yield in lactating Friesian cows. *Slovak J. Anim. Sci.*, **44**: 13-20.

Naik, P.K., Saijpaul, S., Sirohi, A.S. and Raquib, M. 2009. Lactation response of crossbred dairy cows fed on indigenously prepared rumen protected fat. *J. Anim. Sci*., **79**: 1045-1049.

Pires, J.A.A. and Grummer, R.R. 2008. Micronutrients and their impact on high performing dairy cows - A focus on niacin and choline. In: Proceedings of Southwest Nutrition and Management Conference, Department of Animal Sciences, University of Arizona.

Rajesh, G., Singh, M., Roy, A.K. and Singh, S. 2014. Effect of prilled fat supplementation on milk yield, composition and plasma hormones in early lactation crossbred cows. *J. Biol. Innovat.,* **3**: 216-224.

Silvestre, F.T., Carvalho, T.S.M., Francisco, N., Santos, J.E.P., Staples, C.R., Jenkins, T.C. and Thatcher, W.W. 2011. Efffects of differential supplementation of fatty acids during the peripartum and breeding periods of Holstein cows. Uterine and metabolic responses, reproduction and lactation. *J. Anim. Sci*., **94**: 189-204.

Singh, M., Sehgal, J.P., Roy, A.K., Pandita, S. and Rajesh, G. 2014. Effect of prill fat supplementation on hormones, milk production and energy metabolites during mid lactation in crossbred cows. *Vet. World*, **7**: 384-388.

Snedecor, G.W. and Cochran, W.G. 2004. Statistical Methods. 9th Edn. The Iowa State University Press, Ames, Iowa, USA.

Thakur, S.S. and Shelke, S.K. 2010. Effect of supplementing bypass fat prepared from soybean acid oil on milk yield and

nutrient utilization in Murrah buffaloes. *Indian J. Anim. Sci*., **80**: 354-357.

Tyagi, N., Thakur, S.S. and Shelke, S.K. 2009. Effect of feeding bypass fat supplement on milk yield, its composition and nutrient utilization in crossbred cows. *Indian J. Anim. Nutr*., **26**: 1-8.

Yadav, G., Roy, A.K. and Singh, M. 2015. Effect of prilled fat supplementation on milk production performance of crossbred cows. *Indian J. Anim. Nutr*., **32**: 133-138.

Zened, A., Combes S., Cauquil L., Mariette, J., Klopp, C., Bouchez, O., Meynadier, A. and Enjalbert, F. 2013. Microbial ecology of the rumen evaluated by 454 GS FLX pyrosequencing is affected by starch and oil supplementation of diets. *FEMS Microbiol. Ecol*., **83**: 504-514.

Zom, R.L.G., Baal, J., Goselink, R.M.A., Bakker, J.A., Veth, M.J. and Vuuren, A.M. 2011. Effect of rumen-protected choline on performance, blood metabolites, and hepatic triacylglycerols of periparturient dairy cattle. *J. Dairy Sci*., **94**: 4016-4027.