Original Research

Augmentation of Productive Performance of Murrah Buffaloes Fed with Prilled Fat and Yeast Culture in Periparturient Period

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Abstract

Experimetnal Murrah buffaloes (18) in early lactation were fed (SG) a mixture of 100g prilled fat and 25g Saccharomyces cerevisiae *from -21day prepartum to 90 days postpartum, while another group of buffalo served as CON. Blood samples were collected at fortnightly intervals and analyzed for plasma glucose, lipid profile (LDL, HDL, cholesterol, triglycerides) and urea level by analytical kits. Milk production and reproductive performance parameters like onset of first postpartum heat, service period and conception rate were recorded. Supplementation of the mixture increased ($p<0.05$) milk yield in SG buffaloes by 24.4% over the CON (9.33 vs. 7.5 kg/d). SG buffaloes exhibited first postpartum estrous earlier ($P<0.05$) by 11 days and had higher conception rate with less number of AI/conception than the CON. Plasma glucose ($p<0.05$), cholesterol and HDL level increased ($p<0.05$) in SG than the CON, however BUN, plasma urea, triglyceride and total protein level remained unchanged by feeding ($P>0.05$). It was concluded that supplementation of prilled fat and S.* cerevisiae *mixture improved milk yield and reproductive performance without affecting BUN, plasma urea, triglyceride, and total protein levels, however glucose, cholesterol levels especially HDL-good cholesterol increased.*

Key words: Energy Metabolites, Lipid Profile, Murrah Buffaloes, Milk Yield, Prilled Fat, *S. cerevisiae*

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Introduction

The period of transition during late pregnancy (-3 weeks) and early lactation (+3weeks) exerts biological and physiological stress on the animal body to compensate for the endocrine changes, additional requirements of the foetus, mammary growth and lactogenesis (Mondal *et al.,* 2014). Several metabolic processeprovide energy and precursors required for synthesis of milk constituents around the time of parturition (Overton *et al.,* 2004; Djokovic *et al.,* 2013). In consequences such a state cause high mobilization of lipids from body fat reserves leading to a state of negative energy balance in early lactation (Reist *et al.,* 2002). Lipomobilization starts in late pregnancy reaching its maximum in the early lactation and is characterized by higher plasma free fatty acids (Djokovic *et al*., 2013) and lower glucose, triacylglycerols and total cholesterol (Reist *et al*., 2002; Sevinc *et al.,* 2003). Under this condition animals draw upon their body reserves to support the milk secretion resulting in weight loss, sub-optimal milk yield and impaired reproductive performance. Attempts have been made to minimize such changes by enriching dietary energy through bypass fat feeding (Sirohi *et al*., 2010). Prilled fat, a bypass fat contains saturated fatty acids that did not influence feed intake but enhance milk production in early lactation cows and buffaloes (Rajesh, 2013; Singh, 2015; Yadav *et al*., 201; Singh *et al.,* 2015). It also have positive impact on reproductive performance in dairy cows (Salem and Bouraoui, 2008; Hess *et al.,* 2008; Lopes *et al.,* 2009) due to fatty acids which act as a precursor of progesterone synthesis via cholesterol and prostaglandins (Staples *et al.,* 1998). The reported improvement from added fat includes higher conception rate (Salem and Bouraoui, 2008; Cerri *et al*., 2009; Moriel *et al*., 2009), increased pregnancy rate, and reduced service period (Lopes *et al*., 2007). In addition, *S. cerevisiae* feeding improves digestion and milk production in lactating animals (Piret *et al*., 2009). However literature on a mixture of prilled fat and *S. cerevisiae* supplementation on milk production and reproductive performance is not available. Considering the above points; a feeding trial was conducted to investigate the effect of prilled fat and S. *cerevisiae* supplementation on biochemical and productive parameters in Murrah buffaloes under field condition.

Materials and Methods

Experimental

Advance pregnant Murrah buffaloes (18) in 2nd parity were selected under field condition based on body weight of animals and were grouped as control (CON) and supplemented (SG). Average CON body weight was 646±16.97 and SG body weight was 645±19.65. Both the group of buffaloes were offered green fodder (maize), wheat straw and concentrate mixture (45:35:10) at 10:00 and 19:00 hr. daily. Buffaloes of SG were additionally fed with a mixture of 100g prilled fat and 25g/d *Saccharomyces*

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cerevisiae (SC) from -21 day of parturition to 90 days of early lactation. The effect of withdrawal of feeding on milk production was recorded for a period of 30 days. Pregnancy diagnosis was carried out as per rectum on day 60 post insemination. Reproductive performance parameters like incidence of first postpartum heat, number of AI/conception, service period and conception rate was recorded. Buffaloes were hand milked twice a day at 7am and 6pm and the yields were recorded.

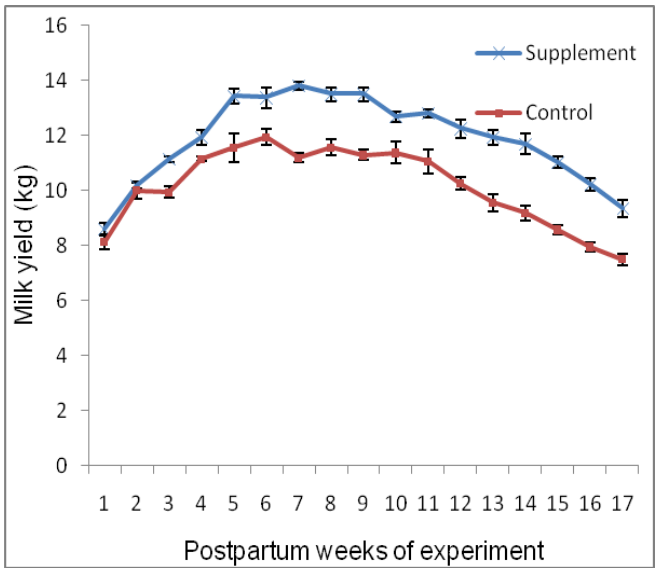

Fig. 1: Average milk yield (kg/d) of experimental Murrah buffaloes

Collection of Samples and Analysis

Blood samples were collected at 8am in heparinized vaccutainer tubes from the jugular vein at 30-day intervals. Plasma glucose, cholesterol, triglycerides, high density lipoprotein (HDL) and low density lipoprotein (LDL) was determined by analytical kits (Avecon Healthcare Pvt. Ltd.). Total plasma protein was estimated by modified Biuret method and the blood urea nitrogen (BUN) was determined by modified berthelot method (Liquimax urea kit; Avecon Healthcare Pvt. Ltd.). Statistical analysis of data was carried out using 2-way ANNOVA with interactions. Means were compared using "t" test.

Results

Feeding of mixture did not influenced milk yields in the first week of experiment in SG over the CON group (8.59 vs. 8.12 kg/d), however milk yield was higher ($P<0.01$) in SG than the CON group (9.33 vs. 7.5 kg/d) at the end of experiment. Mean plasma glucose level was higher in SG than the control ($p<0.03$). Feeding of mixture resulted in increased level of cholesterol, HDL and VLDL ($P<0.05$) at 90th day of experiment than the CON, however their concentration was non- significant between the groups on day 0. Plasma total protein increased ($P>0.05$) in SG over the CON on day 90 of experiment.

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Table 1: Mean plasma concentration of biochemical parameters and lipid profile of experimental Murrah buffaloes

Attributes	Day 1 Postpartum		Day 90 Postpartum	
	CON	SG	CON	SG
Glucose, mg/dl	61.28[a]±0.56	65.28[b]±0.34	65.28[a]±0.56	67.28[b]±1.16
Triglyceride, mg/dl	23.65±0.16	24.26±0.53	25.99±0.48	26.54±0.65
Cholesterol, mg/dl	145.71±1.93	154.7±2.18	183.6[a]±0.99	193.7[b]±1.12
LDL, mg/dl	59.02±1.18	59.74.01±2.09	59.42±1.53	58.31±2.11
VLDL, mg/dl	86.58±2.56	88.08±2.08	91.28[a]±1.16	116.6[b]±4.75
HDL, mg/dl	84.62±1.11	92±1.58	119.1[a]±1.5	145.8[b]±2.27
Urea, mg/dl	27.26±1.74	27.02±1.83	27.81±0.91	28.01±0.96
BUN, mg/dl	9.86±0.32	10.45±0.38	12.08±0.17	11.40±0.25
Total protein, mg/dl	6.36±0.23	6.45±0.31	7.31±0.41	7.86±0.36

Values bearing different superscript [a, b] differ in a row (P<0.05); CON: control group, SG: supplement group

The changes in total protein on day of parturition were non-significant between the groups. BUN and plasma LDL concentration were not influenced by feeding during the experiment. An increase in birth weight of calf was observed in SG than the CON group (25.77 vs. 27.28 kg).

Table 2: Reproductive performance and birth weight of calf

Parameters	Control Group	Supplement Group
Average calf weight	25.77[a]±0.33	27.28[b]±3.5
Still birth	1	-
Distocia	3	1
Metritis	-	-
Pyometra	1	-
Prolaps of uterus	3	1
Retention of placenta	2	1
Calf mortality	2	-
Abortions	1	-

Superscript [a,b] differ (P<0.05) in a column

Table 3: Reproductive performance of Murrah buffaloes

Parameters	Control Group	Supplement Group	Significance p Value
Post partum heat, days	61.11±1.45	50.22±1.1	0.01
First estrus cycle, days	16.55±0.44	15.66±0.41	0.32
Second estrus cycle, days	23.88±0.42	22.77±0.41	0.29
Service period, days	149.89[a]±6.31	122.89[b]±5.68	0.01
No. Of AI/conception	3.88[a]±0.26	2.88[b]±0.2	0.01
Conception rate , %	44	67	0.01

Values bearing different superscript [a, b] differ in a row (P<0.05)

There was one case of still birth, 2 cases of retention of fetal membranes in CON against one case of retention of fetal membranes in SG. Buffaloes of SG exhibited first post partum heat earlier (P<0.05) by 11 days than that of CON. Mean length of first and second oestrous cycle was 16.5 and 15.6 days and

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23.9 and 22.9 days in SG and CON, respectively. There was no significant difference in the length of first and second estrus within the group, but between groups it varied. The service period was reduced by 27 days ($P<0.05$) in SG over the CON group. Overall conception rate was lower in CON group (45%) than the SG buffaloes (67%).

Discussion

The higher peak yield and milk production performance in SG buffaloes was attributed to enrich energy of the ration by prilled fat in cows (Rajesh *et al.,* 2015; Yadav *et al.,* 2015) and buffaloes (Shikha *et at.,* 2016; Ajithakumar *et al.*, 2107). Significant increases in milk production with yeast supplementation in cows have been attributed to effective digestion by increase in number of cellulolytic bacteria (Dawson, 1990). The galactopoietic effect of feeding mixture was evident from the higher milk yields recorded after withdrawal of feeding (Tyagi *et al.,* 2009). The higher plasma cholesterol levels have been implicated for better reproductive performance as cholesterol acts as a precursor of steroid hormones (Staples et al. 1998). This could be the reason of improved reproductive performance of SG buffaloes than the CON buffaloes in this study. Plasma cholesterol level progressively increased ($P<0.05$) during the feeding of mixture *due to* enhanced uptake of dietary fatty acid (Fahey *et al.,* 2002; Kumar *et al.,* 2007; Singh *et al.,* 2015). The increase in HDL cholesterol, good cholesterol in SG buffaloes might have contributed long-chain fatty acids and unsaturated fatty acids like palmitic, stearic, elaidic, oleic, and linoleic acids (Shelke *et al.,* 2012). The greater concentration of plasma lipid metabolites in bypass fat fed animals could be used as a tool to increase intestinal secretions of lipoproteins (HDL and LDL). The LDL cholesterol (bad cholesterol) molecules are major carriers of cholesterol in blood which are oxidized and taken up by macrophages and form foam cells which become trapped in the walls of blood vessels leading to atherosclerotic plaque formation (Jonathan *et al.,* 2011). In contrast, HDL cholesterols have inverse correlation with this risk (Karcagi *et al.,* 2010). It has also been found that blood concentration of these metabolites has a high correlation coefficient with milk (Shelke *et al.,* 2012). The increased HDL cholesterol ($P<0.05$) without change in LDL cholesterol level suggest that there was no adverse effect of bypass fat feeding on animal health and possibly a beneficial role on the human health when such milk or milk products are consumed. This fact was also evident from the unaltered levels of plasma total protein, urea and BUN (Abd El-Tawab, 2007; Helal and Abdel-Rahman, 2010). However long term studies on this aspect for the entire lactation needs to be carried out. The positive impact of feeding mixture on early involution of uterus resulted in early commencement of postpartum cyclicity and higher conception rate in SG buffaloes (Shikha *et al.*, 2016). Though no difference in conception rate on dietary supplementation of inert fat in high yielding dairy cows has been reported (Petit and Twaqiramungu, 2006).

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Conclusion

Feeding of prilled fat and *S. cerevisiae* mixture has tremendous scope to enhance the milk production and reproductive performance of periparturient Murrah buffaloes under filed conditions. The supplementation could be given with the concentrate mixture and has no adverse effect on animal health as evident by high HDL levels without changing LDL, BUN, urea, total protein and triglyceride levels. The higher birth weight of the calf will ensure the low mortality in buffaloes.

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