Original Research

Reproductive Performances in Lactating Murrah Buffaloes Supplemented with Soybean Oil

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Rec. Date:	Jan 19, 2019 12:24
Accept Date:	Mar 23, 2019 09:59
DOI	10.5455/ijlr.20190119122434

Abstract

The study was conducted at livestock farm, Adhartal, College of Veterinary Science & Animal Husbandry, NDVSU, Jabalpur (M.P.). Twelve advance pregnant Murrah buffaloes were selected 21 days pre-partum and divided in two groups of six each; CON as control without supplementation and SBO as soybean oil supplementation @ 200 ml/animal/day upto 90 days post-partum to study the effect on reproductive performances in lactating Murrah buffaloes. The results revealed non-significant improvement in average birth weight of calves by 9.77%, first post-partum estrus by 15 days, service period by 28 days, first service conception rate by 33.33% and time for expulsion of foetal membranes by 1.63 hrs in SBO as compared to CON. No positive cases of dystocia were observed throughout the study however, both the groups shared equal incidences (16.66%) of retention of foetal membranes. In conclusion, the overall reproductive performances were found better in SBO as compared to CON.

Key words: Conception Rate, Estrus, Foetal Membranes, Service Period, Murrah, Soybean Oil

How to cite: Yadav, A., Lakhani, G., Roy, B., Ghosh, S., & Aharwal, B. (2019). Reproductive Performances in Lactating Murrah Buffaloes Supplemented with Soybean Oil. International Journal of Livestock Research, 9(4), 206-211. doi: 10.5455/ijlr.20190119122434

Introduction

Milk production is an energy expensive biological process and during early lactation, energy is required by the uterus, ovary, and hypothalamus/pituitary glands of the animal to undergo a process of recovery and rebuilding for the establishment of subsequent pregnancy (Khalil *et al*., 2012). Cereal grains and fats play a valuable role as sources of energy in the ration of dairy animals. But excessive proportion of cereals in the diet give rise to suboptimal rumen environment, cause rumen acidosis, reduce fibre digestibility and milk fat concentration and therefore, fat supplementation has become a subject of interest to fulfil the energy requirements and support milk production (Yadav *et al*., 2018). The influence of fat supplementation during the transition period has led to the improvement in conception rate (Cerri *et al.*, 2009), pregnancy rate, and

service period (Lopes *et al*., 2009) due to fatty acids which act as a precursor of progesterone via cholesterol and prostaglandins (Staples *et al*., 1998). Unique dietary formulations are targeted for the benefit of reproductive performances and represent a challenging new area of postpartum research (Thatcher and Staples, 2000). In this context, vegetable oils appear to have the greatest impact on reproductive performance such as soybean oil (Mandebvu *et al*., 2003). Therefore, the trial was designed to investigate the effect of soybean oil supplementation on the reproductive performances of lactating Murrah buffaloes.

Materials and Methods

The proposed work was conducted on twelve advance pregnant Murrah buffaloes for a period of six months at Livestock Farm, Adhartal, College of Veterinary Science & A.H., Nanaji Deshmukh Veterinary Science University, Jabalpur (M.P.). The study was conducted during 21 days pre-partum to 90 days post-partum after the adaptation period of 10 days. The animals were selected on the basis of similarity in body weight, age, parity (1^{st} to 3^{rd}) and previous lactation yield. The animals were randomly assigned into two groups of six each as CON (control) with basal diet and SBO as soybean oil supplementation @ 200 ml/animal/day. Experimental animals were stall fed and maintained in semi-intensive system of housing. All The experimental animals were fed total mixed ration according to their body weight and production as per ICAR (2013). The chaffed green fodder and wheat straw were offered *ad libitum* and concentrate consisting of 18 per cent crude protein and 70 per cent total digestible nutrients was offered at a scale of 1 kg per 2.0 kg milk production along with maintenance ration as per routine practices at the farm. Measured quantity of soybean oil was mixed daily in concentrate at the time of feeding. Half of the total required quantity of feed was offered daily at morning 5.30 am and rest amount offered in the afternoon 3.00 pm. The water was kept available to animals round the clock.

The parameters recorded were- The birth weight of each calf was measured with the help of electronic weighing balance. First post-partum estrus was observed by the visual observation and acceptance of a male by the female, which is the most prominent and reliable symptom of estrus in buffalo. The service period was calculated from the date of calving to date of successful conception. The first service conception rate was calculated by the percentage of experimental buffaloes conceiving out of the total buffaloes at first service. Dystocia was calculated by the percentage of assisted calvings out of total no. of calvings. After parturition, the buffaloes were kept under constant watch for recording the time of expulsion of foetal membranes as the period from end of the delivery of foetus to end of complete expulsion of foetal membranes and the buffaloes that did not shed the foetal membranes within 12 hours of parturition were considered as positive case of retention of foetal membranes.

 DOI 10.5455/ijlr.20190119122434

Statistical Methods

Data were analyzed using ANOVA, described by Snedecor and Cochran (1994) and means showing significant differences in the ANOVA table were compared using the Duncan's Multiple Range Test (Steel and Toorie, 1980).

Results and Discussion

The detail reproductive performances of lactating Murrah buffaloes are presented in Table 1. The average birth weight of calves varied non-significantly between the groups and the values were numerically higher in SBO by 9.77 per cent than CON.

Table 1: Effect of soybean oil supplementation on reproductive performances in lactating Murrah buffaloes (Mean±SE)

S. No.	Particulars	CON	SBO
1	Average birth weight of calves (kg)	29.98±1.86	32.91±0.63
2	Average first post-partum estrus (days)	55.17±6.15	40.17±7.82
3	Average service period (days)	72.00±7.68	44.00±11.43
4	Average first service conception rate (%)	50	83.33
5	Dystocia (%)	0	0
6	Average time for expulsion of foetal membranes (hrs)	7.33±2.28	5.70±1.66
7	Retention of foetal membranes (%)	16.66	16.66

The calves born under SBO had straight and glossy hairs than CON with curly and rough hairs distributed over the body. The present study corroborated the findings of Ramteke *et al.* (2014); Singh *et al.* (2016) and Thul *et al.* (2017). Several findings have revealed higher plasma progesterone concentration and lower insulin level on fat supplementation. The higher progesterone level may have provided better nourishment to foetus in the final stages of pregnancy (Son *et al*., 1996) whereas; Thul *et al.* (2017) reported that dietary fat breaks into fatty acids and glycerol, where glycerol forms glucose, which in insufficiency of insulin is not utilized by cells. This lower insulin level has glucose sparing effect that might have diverted the spared energy towards the foetal growth. Therefore, the birth weight of calf was higher in SBO.

The results revealed non-significant improvement in first post-partum estrus in SBO by 15 days in comparison to CON. Similar findings have shown reduction in the onset of cyclicity (days) in treatment groups by 9.12 (Ramteke *et al*., 2014); 27 (Singh *et al*., 2016) and 24.18 (Parihar *et al*., 2018). Linoleic acid content is more in soybean oil that act as substrate for PGF2α synthesis. Linoleic acid can be desaturated and elongated to form arachidonic acid which is a precursor of PGF2α and the regulatory enzymes for this conversion include Δ^6-desaturase and cyclooxygenase. Supplementation of fat is associated with reduction in serum concentrations of oestradiol (Hightshoe *et al*., 1991). Further, increase in PGF2α reduces progesterone concentration which consequently changes the oestradiol: progesterone ratio and thus, induces modifications in secretory pattern of gonadotrophin hormones. This leads to the

 DOI 10.5455/ijlr.20190119122434

development of an ovulatory follicle which stimulates return to ovarian cycling (Funston, 2004). The service period was achieved earlier in SBO by 28 days in comparison to CON, although varied non-significantly. The findings were supported by Gowda *et al.* (2013); Ramteke *et al.* (2014) and Thul (2014) where service period was reduced by 25.00; 32.56 and 7.50 days in supplemented over control group. The findings interpret that fat may increase the blood cholesterol concentration. Pregnanolone, which is a cholesterol derivative acts as the precursor of progesterone and the regulatory enzyme required for this conversion is 3β-hydroxysteroid dehydrogenase. This Increase in progesterone concentration helps in improving the fertility in lactating Murrah buffaloes (Staples *et al*., 1998).

Out of 6 animals in each group, 5 animals conceived in their first service in SBO followed by 3 animals in CON. SBO exhibited 33.33 per cent higher first service conception rate as compared to CON and is supported by Thul (2014); Singh *et al.* (2016) and Suharti *et al.* (2017). PUFAs or their biohydrogenated metabolites, can be absorbed by the uterus and inhibit the production and release of PGF2α in the endometrium at the beginning of pregnancy. This would prevent the regression of the corpus luteum in the ovary and allow the continuous production of progesterone, favouring embryo survival (Bilby *et al*., 2006 and Silvestre *et al*., 2011). There were no positive cases of dystocia between the groups of lactating Murrah buffaloes raised under different treatments during the experimental trial.

CON exhibited non-significant delay in expulsion of foetal membranes by 1.63 hrs as compared to SBO and is supported by Tyagi *et al.* (2010); Khalil *et al.* (2012) and Thul (2014) where time to expel foetal membranes in supplemented group was reduced by 5.40; 3.60 and 3.10; and 4.00 hrs., respectively. Generally, feeding buffalo on high energy diet had significantly positive effect on normal time needed from calving to release of foetal membranes (Hafez and Hafez, 2008). There were equal incidences of RFM in CON and SBO, suggesting that out of 6 animals in each group, 1 animal suffered from RFM. The present findings are in agreement with the findings of Tyagi *et al.* (2010); Thul (2014) and Singh *et al.* (2016). Foetal membranes separate when foetal cortisol induces the production of enzymes; 17-hydroxylase and aromatase in placenta, which favours oestrogen synthesis at the expense of progesterone synthesis. Maternal plasma levels of oestradiol-17 increase suddenly, while plasma levels of progesterone decline sharply immediately prior to parturition. It is supposed during the week before parturition, the level of oestrogen reaches its maximum level to help the uterus to get rid of any remnant of foetal membranes (Chassagne and Barnouin, 1992). But, fat supplementation has been associated with reduction in serum oestradiol concentration; therefore, a decreased level of serum oestradiol may be indicated as a factor enhancing RFM in SBO. In addition, serum cholesterol concentration declines 2 weeks pre-partum until 1-2 weeks post-partum and is the primary cause for RFM in CON (Kaneene, 1997).

DOI 10.5455/ijlr.20190119122434

Conclusion

The present findings indicate that supplementation of soybean oil has kept the animals in positive energy balance that subsequently improved their reproductive performances viz. higher birth weight of calves, early first post-partum estrus and service period, higher first service conception rate and shorter time to expel foetal membranes in comparison to CON. There were no positive cases of dystocia between the groups. However, there were equal incidences of retention of foetal membranes in CON and SBO. Hence, SBO supplementation could be recommended during transition period and early lactation to get maximum benefits to the farmers by improving reproductive performances.

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 DOI 10.5455/ijlr.20190119122434