



Effect of supplementary feeding of glucogenic and lipogenic diet on body parameters and onset of ovarian cyclicity in postpartum dairy buffaloes

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Negative energy balance (NEB) reduces the ability of uterus to recover after calving and may result in persistent inflammatory mediated damage (Kaczmarowski *et al.* 2006). A period of severe NEB in early lactation may affect fertility. Body weight (BW) and body condition score (BCS) indicate health status of an animal. A minimum BCS of 2.5 at calving is considered ideal for optimum reproduction (Knop and Cernescu 2009). In addition, feeding of glucogenic diets and by-pass fats during early lactation tend to stimulate the partitioning of energy to body reserves and improve the energy balance (Vanknegsel *et al.* 2007). Keeping in view the above facts, an attempt was made to study the effect of supplementation of glucogenic and lipogenic diets on physical parameters in association with onset of ovarian cyclicity in postpartum dairy buffaloes.

The study was conducted on 30 healthy, lactating, recently calved pluriparous Murrah buffaloes in their second to fifth parity maintained under uniform management conditions and feeding schedule at an organized Dairy Farm. The animals were classified into group 1, buffaloes (10) were supplemented with glucogenic precursor @ 100 g/day starting from day of parturition up to 56 days in addition to routine feeding; group 2, buffaloes (10) were supplemented with lipogenic rumen by-pass fat @ 200 g/day starting from day of parturition up to 56 days in addition to routine feeding; group 3, buffaloes (10) were maintained on routine diet without any nutritional supplementation and served as control.

Animals in all the groups were observed for change in BCS, back fat thickness (BFT) and overt estrus. The BFT was measured between the 12th and 13th rib over the Longissimus muscle on the right side of each animal using a real time B-mode diagnostic ultrasound scanner equipped with a 5/7.5 MHz linear array transducer. All the body parameters were recorded at weekly interval up to 56 days postpartum.

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The buffaloes were subjected to body condition scoring (scale 1–5; Edmonson *et al.* 1989). Heart girth and length of animal were measured using weight band. The weight of the animals was calculated from heart girth and length by using Mullick's formula.

$$\text{Body weight (kg)} = 25.156 \times G - 960.232/2.2$$

where G, heart girth (in inches). Ultrasonographic examination of ovarian activity was carried after 25 days of parturition till 56 days postpartum at weekly intervals using a real time B-mode diagnostic ultrasound scanner equipped with a 5/7.5 MHz linear array transducer.

The differences between 3 groups for impact of supplementary feeding on body parameters were tested using ANOVA. Significant interactions between 3 groups were tested using Duncan's multiple range test. Differences in mean ($\bar{x} \pm \text{SEM}$) physical parameters in 3 groups were subjected to factorial CRD using SPSS.

There was a continuous decrease in BCS from calving till the end of experiment in all the groups. Significant effect ($P < 0.05$) of dietary supplementation on BCS in the buffaloes was noted. An overall higher mean BCS in treatment groups as compared to their controls was in agreement to an earlier report by Fonseca *et al.* (2004). Decline in BCS observed in this study could be due to rapid mobilization of body fat reserves immediately after parturition for the energy requirements for maintenance and lactation. Average body condition loss was more in group 3 (1.50) than in group 2 (1.19) and group 1 (1.19). This may probably be due to better stores of adipose tissue in supplemented animals as a result of improvement in energy status. El-Wishy *et al.* (2007) reported better BCS owing to supplementary feeding in dairy buffaloes.

Body weight is an index of the health status of an animal. The BW differed nonsignificantly on day of parturition in different groups. On day 56 postpartum the BW of buffaloes in groups 1 and 2 were significantly ($P < 0.05$) higher as compared to group 3 indicating better gain in the former. Similarly, total mean BW was significantly ($P < 0.05$) high in supplemented buffaloes (477.9 ± 4.1 kg in group 1 and 469.1 ± 4.4 kg in group 2) than in control ones (454.5 ± 5.3 kg). There was a continuous decline in the body weight up to 56 days postpartum. All the buffaloes lost weight at a

faster rate during the first 21 days postpartum compared to the rest of the period. A lactating animal continuously loses weight due to stress of production. Higher body reserves at parturition and early lactation as compared to mid lactation lead to loss of BW at a quicker rate (Baruselli *et al.* 2001). Average daily weight loss was highest in buffaloes of group 3 (0.9 kg/day) followed by group 2 (0.8 kg/day) and group 1 (0.6 kg/day). The probable reason may be due to improved energy status in supplemented buffaloes.

The nutritional status of animal can be evaluated through BFT, as it reflects the body energy reserves available for metabolism, growth, lactation and milk yield (Kessel 2008). In the current investigation, there was a significant ($P < 0.05$) difference between the control and the supplemented groups for BFT with greater reduction during the first 21 days postpartum. Overall mean BFT was significantly ($P < 0.05$) higher in groups 1 (10.4 ± 0.3 mm) and 2 (10.1 ± 0.3 mm) as compared to control group (9.1 ± 0.4 mm). Therefore, average loss in BFT over the 56 days postpartum was more in the control group (3.3 mm) than in the treatment groups (2.4 mm in group 1 and 2.6 mm in group 2). Eventually, better nutrition of the animals in the treatment groups during the transition period might be responsible for higher BFT in the current set of experiments.

Onset of first postpartum estrus was recorded at 36.5 days, 43.2 days and 46.5 days in the buffaloes of groups 2, 1 and 3, respectively. Ultrasound examination of the ovaries revealed mean largest follicles in group 2 (11.0 ± 0.3 mm) than in groups 1 (10.7 ± 0.3 mm) and 3 (10.7 ± 0.2 mm) in the first estrus. The resumption of postpartum ovarian activity is influenced by nutrition. Dietary supplementation increases the level of plasma LH which is important for development of follicles (Vale and Silva 2000). In the present study, supplemented fat had a positive impact on growth dynamics of the follicles. Early onset of estrus in group 2 animal's supplemented with bye pass fat as compared to their counterparts is in agreement with Wathes *et al.* (2007) who observed that fat supplements shortened the period to onset of postpartum ovarian cyclicity, enhanced the recruitment of large sized follicles and increased the metabolic hormones. A significant ($P < 0.05$) increase in the mean corpus luteum size was noted in groups 2 (13.7 ± 0.6 mm) and 1 (12.9 ± 0.4 mm) than in their control counterparts (11.4 ± 0.6 mm). The larger size of corpora lutea in fat supplemented buffaloes may be due to more availability of essential fatty acids that are important for steroidogenesis and granulosa cell proliferation (Childs *et al.* 2008). While only one (10%) buffalo experienced standing estrus in groups 1 and 3, three buffaloes (30%) among group 2 exhibited standing estrus during the period of study. A higher percentage of estrus expression in the supplemented groups may be due to better body conditioning and lower losses in body reserves and higher levels of circulating luteinizing hormone due to increased energy intake immediately after parturition.

SUMMARY

The present study was undertaken to assess the effect of

supplementation of glucogenic and lipogenic diets on certain physical parameters and onset of postpartum ovarian cyclicity in dairy buffaloes. Healthy postpartum pluriparous Murrah buffaloes (30) were classified into group 1, buffaloes (10) were supplemented with glucogenic precursor in addition to routine feeding; group 2, buffaloes (10) with rumen by-pass fat in addition to routine feeding; and group 3 buffaloes (10) maintained on routine diet without any additional supplementation served as control. The BCS was significantly high in group 2 buffaloes than in group 1 and group 3 buffaloes. Supplemented compared to control counterparts had significantly higher BW and BFT. The resumption of postpartum ovarian activity was influenced by nutrition. Group 2 and 1 buffaloes experienced early onset of first postpartum estrus than group 3 buffaloes. Thus, it can be recommended to supplement the diet with high energy rations in the early postpartum period to improve the reproductive efficiency of buffaloes.

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