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Research Article

BLOOD BIOCHEMICAL AND MINERAL STATUS IN CYCLIC AND POSTPARTUM ANESTRUS BUFFALOES

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ABSTRACT
In this work, a comparison of the blood biochemical and mineral profile of anestrus buffaloes with those of regular cyclic animals was made. There was significant reduction ($P<0.01$) in the total cholesterol and phosphorus levels in anestrus state. However, blood glucose, HDL-cholesterol, triglycerides, calcium, copper, cobalt, manganese and zinc levels did not differ between anetrus and regular cyclic condition.

Key words: *Anestrus, Biochemicals, Minerals, Buffaloes*

INTRODUCTION
Buffaloes account for 56 per cent of country's total milk production (FAOSTAT, 2008). However, reproductive performance in buffaloes is greatly affected by anestrus condition. The incidence of anestrus in buffaloes in the Indian subcontinent and Egypt varies from 31–42 per cent (El-Wishy, 2007). During immediate post-partum period, metabolic changes induced by mismatching of energy requirements and energy intake may lead to negative energy balance, which impacts the subsequent fertility. Assessing metabolic profile of dairy animals can reveal the reasons behind differential fertility (Jorritsma *et al.* 2003). Hence, the present work was planned to examine the blood biochemical and mineral status during post-partum anestrus in buffaloes.

MATERIALS AND METHODS
The present study was conducted on healthy she buffaloes in the reproductive stage of second to fourth parity belongs to Namakkal, Salem and Karur districts of Tamilnadu state. The buffaloes, which did not express estrus signs for more than 5 months postpartum were examined gyneco-clinically twice at 10 days interval. Those animals having smooth ovaries with no palpable structures and having no clinically detectable abnormalities in their genital tract were categorized as true anestrus animals (43 numbers, Group I). The selected animals belonged to small farmers in rural areas and were mostly maintained on grazing for 3-4 hours per day and supplemented with mixed ration of paddy straw, dried jowar, greens along with little concentrate feed. Drinking water was provided to animals *ad lib*. The selected animals were routinely being subjected to bathing under tap water/ wallowing in pond water by the owners. Ten numbers of regular cycling buffaloes maintained at similar management and feeding conditions as anestrus animals were selected to serve as control (Group II).

Blood samples from true anestrus buffaloes and regular cycling buffaloes were collected from jugular vein using 16G needle in the heparinized vaccutainer. The plasma was separated from the samples and analysed for biochemical profile viz., blood glucose, total cholesterol, HDL-cholesterol, triglycerides and mineral profile viz., calcium, phosphorus, copper, cobalt, manganese and zinc.

Blood glucose, total cholesterol, HDL-Cholesterol, triglycerides, calcium and phosphorus levels were determined spectrophotometrically (SYSTRONICS UV-VIS double beam spectrophotometer, Model 2202, India) using standard diagnostic kits (Span Diagnostic kits,

Surat, India). The micro minerals like copper, manganese, zinc and cobalt levels were determined using atomic absorption spectrophotometer (Perkin Elmer, USA, Model 3110). The completely randomized design method was followed for the experiment and the data collected were analysed using SPSS® 10.0. Software package

RESULTS AND DISCUSSION

The plasma glucose level (mg/dl) for anestrus buffaloes and regular cyclic buffaloes are shown in table. The results revealed no significant variation in plasma glucose level between anestrus and regular cyclic buffaloes. The plasma glucose levels of this study are in agreement with Anita *et al.,* (2004) for normal cyclic and anestrus buffaloes. On the other hand, Singh *et al.,* (2010) observed that plasma glucose was not a metabolic regulator responsible for initiation of ovarian cyclicity. The hypoglycemic state in buffaloes reduced the hypothalamic-hypophyseal-ovarian axis signal transmission leading to anestrus condition (Sharma *et al*., 1998). In this study, as there was no difference in plasma glucose level between anestrus and regular cyclic buffaloes, plasma glucose level may not be an important factor for the anestrus state in buffaloes of this study area.

Animals in the anestrus state had significantly ($P<0.01$) lower total cholesterol level. The findings of the present study concurs with the observations of Sarvaiya and Pathak (1992) who reported that the total cholesterol level was significantly lower in anestrus buffaloes compared to normal cycling buffaloes. On the contrary, Shah *et al.,* (2003) and Yadav *et al.,* (2006) did not find any difference in total cholesterol values between anestrus and normal buffaloes. Dutta *et al.,* (1988) suggested that high cholesterol content in normal cyclical animals compared to anestrus cattle could be an indicator of enhanced steroid secretion. Pereek and Dean (1985) also pointed out that hypocholesterolemia might lead to improper output of steroids. The reduced level of total cholesterol during anestrus state in the present study suggested that it might have had a role in normal reproduction in buffaloes.

Table 1: Mean (±SE) blood biochemical and mineral levels in anestrus and regular cyclic buffaloes

Parameter	Group I (Anestrus)	Group II (Regular cyclic)
Glucose (mg/dl)	51.86 ± 1.01	56.90 ± 3.30
Total cholesterol (mg/dl)	136.39^{a} ± 4.19	167.07^{b} ± 6.03
HDL-cholesterol (mg/dl)	58.33 ± 2.07	55.59 ± 3.76
Triglycerides (mg/dl)	25.29 ± 0.89	26.71 ± 1.33
Calcium (mg/dl)	8.63 ± 0.25	8.32 ± 0.36
Phosphorus (mg/dl)	4.22^{a} ± 0.13	6.15^{b} ± 0.17
Copper (µg/ml)	0.641 ± 0.02	0.689 ± 0.04
Cobalt (µg/ml)	0.480 ± 0.03	0.551 ± 0.15
Manganese (µg/ml)	0.173 ± 0.01	0.186 ± 0.02
Zinc (µg/ml)	1.127 ± 0.04	1.203 ± 0.12

Means within the same row bearing different superscripts differ significantly (P<0.01).

The HDL-cholesterol (mg/dl) levels of the anestrus and regular cyclic buffaloes did not vary significantly. HDL-cholesterol is the predominant class of cholesterol in follicular fluid of bovines (Brantmeier *et al.,* 1987) and Bao *et al.,* (1995) suggested that HDL-cholesterol was important for steroidogenesis in luteal cells *in vitro.*

The plasma triglyceride levels (mg/dl) between anestrus and regular cyclic buffaloes had no significant variation. The serum triglycerides concentration was not related to resumption of postpartum ovarian cyclicity in cattle (Dhoble *et al.,* 2004). Elevated triglycerides level in the

blood is the indicator of fat mobilization due to negative energy balance (Schneider, 2004). Guedon *et al.,* (1999) reported that triglycerides do not appear to play a direct regulatory role in ovarian steroidogenesis, but they serve as useful metabolic fuel for bovine oocyte maturation (Ferguson and Leese, 1999). In the present study, no variation in triglycerides level in buffaloes of both the groups indicates that energy level may not be a cause for anestrus in these animals.

The plasma calcium (mg/dl), copper, cobalt, manganese and zinc (µg/ml) levels of the anestrus and regular cyclic buffaloes revealed no significant variation.

The plasma calcium level concurs with the findings of Paul *et al.,* (2000) and Yadav *et al.,* (2006) who found no significant difference in calcium level between normal cyclic and postpartum anestrus buffaloes, whereas Khasatiya *et al.,* (2005) observed significantly lower calcium level in anestrus buffaloes compared to cyclic buffaloes. In general, the level of blood calcium alone might not affect the normal reproductive physiology of animals directly but alteration of Ca: P ratio affected the ovarian function through its blocking action on pituitary gland and resulted in prolongation of first estrus and ovulation.

The mean plasma phosphorus (mg/dl) level of buffaloes in anestrus state showed significantly lower level ($P<0.01$) compared to regular cyclic buffaloes. The observations of the present study agree with Hala *et al*., (2009) for anestrus buffaloes. However, Newar *et al*., (1999) did not find any difference in phosphorus level between cyclic and anestrus buffaloes. The involvement of phosphorus in phospholipids and cAMP synthesis may be a key factor to its effect on reproduction. A close correlation between the reproductive hormones and inorganic phosphorus exist and marginal phosphorus deficiency may lead to anestrus condition (Hurley and Doane, 1989).

The plasma copper levels of the present work are in agreement with Paul *et al.* (2000) for buffaloes. On the other hand, Yadav *et al.,* (2006) and Akhtar *et al.,* (2009) reported low copper level in anestrus buffaloes compared with cyclical buffaloes. The association of copper with resumption of ovarian activity and fertility has been reported by Manickam *et al.,* (1977).

Khasatiya *et al.,* (2005) and Singh *et al.,* (2006) did not find any variation in cobalt level between anestrus and cyclic buffaloes. However, Prasad and Rao (1997) reported lower cobalt level in the blood of anestrus cows compared to cyclical cows.

The plasma manganese levels of the buffaloes of this work are in agreement with Khasatiya *et al*., (2005). However, Wilson (1966) reported manganese deficiency in dairy cattle results in anestrus or irregular return to estrus, sometimes with extended periods of anestrus.

The results of this study for zinc concurs with the findings of Paul *et al*., (2000) in buffaloes, whereas Yadav *et al.,* (2006) and Akhtar *et al*., (2009) observed significantly lower zinc level in anestrus buffaloes compared to cyclic buffaloes.

It was concluded form the study that the deficiency of plasma total cholesterol and phosphorus could be responsible for anestrus condition in buffaloes and by improving the nutritional status, fertility may be improved in this species.

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