COMPARATIVE BLOOD PROFILE OF PROGESTERONE, METABOLITES AND MINERALS IN ANOESTRUS, SUBOESTRUS, REPEAT BREEDING AND NORMAL CYCLIC BUFFALOES

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ABSTRACT

A comparative study on serum profile of progesterone (P4) and metabolites of 37 anoestrus, 10 suboestrus, 53 repeat breeding and 12 normal cyclic buffaloes revealed that the serum P4 was significantly (P<0.01) higher in suboestrus (3.36±0.50 ng/ml) as compared to anoestrus, repeat breeders and normal cyclic buffaloes (1.24±0.21, 0.45±0.05 and 0.36±0.08 ng/ml). The serum total protein in anoestrus, suboestrus and repeat breeding buffaloes was significantly (P<0.05) lower (8.69±0.25, 9.62±0.59 and 9.06±0.21 g/dl) than that in the normal cyclic buffaloes (11.05±0.30 g/dl). Cholesterol was lower (P<0.01) in anoestrus and repeat breeding buffaloes (168.82±8.14 and 143.97±7.49 mg/dl) as compared to suboestrus and normal cyclic ones (184.84±14.83 and 183.09±11.70 mg/dl). The calcium levels though low in infertile buffaloes did not differ significantly from normal cyclic buffaloes. The serum magnesium content of normal cyclic buffaloes was significantly higher (4.18±0.11 mEq/L) than that of all three categories of infertile animals. The serum trace minerals, zinc, iron and manganese levels did not differ significantly among different groups of infertile and normal cyclic buffaloes. However, the serum copper level in repeat breeders was significantly (P<0.05) higher (1.10±0.06 ppm) and cobalt was lower (0.08±0.01 ppm) as compared to anoestrus, suboestrus and even normal cyclic buffaloes. The findings suggested the importance of the above elements in maintaining normal reproductive rhythm of buffaloes.

KEY WORDS: Blood profile, Buffalo, Anoestrus, Suboestrus, Repeat Breeders, Normal cyclic.

INTRODUCTION

Fertility is one of the key determinants in the lifetime performance of an animal. Hence, the reproductive disorders in dairy animals need to be detected as early as possible for institution of correct and timely therapy. Prolonged postpartum anoestrum, suboestrus and repeat breeding are the major issues of economic losses to buffalo breeders. The cyclic irregularities certainly impose difficulties in oestrus detection programme. The differentiation between true anoestrus and suboestrus is particularly important in buffaloes because of their weak oestrus signs and small ovaries (El-Wishy, 2007). In recent years, considerable attention has been focused on reproductive endocrinology and biochemistry as a means to identify specific reproductive problems and to adopt appropriate therapeutic measures for augmenting bovine fertility. The data particularly on this line will help to rectify such physiological abnormalities either by feeding, treatment or by other managemental means. Information on the association between circulatory profiles of endocrine, biochemical and mineral constituents all together in anoestrus, suboestrus and repeat breeding buffaloes in relation to normal cyclic ones is scarce, and hence was studied and is reported in this paper.

MATERIALS AND METHODS

This study was conducted from August 2007 to March 2008 at two villages of Anand district in Gujarat. All together 1020 buffaloes beyond 3 months postpartum were examined to know the reproductive disorders through gynaeco-clinical examination. These buffaloes were maintained by

farmers at their doorstep on green/dry roughage and compounded concentrate mixture (Amul Dan) supplemented with 30 g/d of mineral mixture. The problem breeders were confirmed by rectal palpation twice 10 days apart. The jugular blood samples from the representative numbers of anoestrus (37) and suboestrus (10) case were collected at random, while from repeat breeders (53) and normal cyclic (12) buffaloes the samples were obtained at estrus/AI. The serum samples were stored with a drop of merthiolate (0.1%) at -20°C till analyzed.

Serum progesterone was estimated by RIA technique of Kubasic et al. (1984). The sensitivity of the assay was 0.1 ng/ml, and intra- and inter-assay coefficients of variation 5.4 and 9.1 %. The serum biochemical constituents, viz. total protein, total cholesterol and macro-minerals, viz. calcium, inorganic phosphorus and magnesium were estimated using standard procedures and kits procured from Coral Clinical Systems, Goa, India, with the help of Chemwell auto-blood analyzer (Awareness Technology, Germany). The blood sera samples (1 ml each) were wet digested with 5 ml volume of di-acid mixture (perchloric acid : nitric acid; 1:4) on a hot plate according to the method of Krishna and Ranjhan (1980). Estimations of trace elements, viz. copper, cobalt, zinc, iron and manganese were done of wet digested samples on an Atomic Absorption Spectrophotometer (Model- 3110, Perkin Elmer). The data were analyzed using CRD and critical difference test (Snedecor and Cochran, 1986).

RESULTS AND DISCUSSION

The serum progesterone concentration was significantly ($P<0.01$) higher in suboestrus buffaloes than in anoestrus or repeat breeders and normal cyclic buffaloes in oestrus (Table 1). The higher progesterone level in suboestrus and anoestrus buffaloes could be due to presence of persistent or functional CL on either of the ovaries at the time of blood sampling, which was done at random,

Table 1. Comparative plasma profile of progesterone, metabolites and minerals in anoestrus, suboestrus, repeat breeding and normal cyclic buffaloes

Plasma constituents	Reproductive status			
	Anoestrus (n=37)	Suboestrus (n=10)	Repeat breeders (n=53)	Normal cyclic (n=12)
Progesterone (ng/ml)	1.24 ± 0.21^{b}	3.36 ± 0.50^{c}	0.45 ± 0.05^{a}	0.36 ± 0.08^{a}
Total protein (g/dl)	8.69 ± 0.25^{a}	9.62 ± 0.59^{ab}	9.06 ± 0.21^{a}	11.05 ± 0.30^{b}
Total cholesterol (mg/dl)	168.82 ± 8.14^{b}	184.84 ± 14.83^{c}	143.97 ± 7.49^{a}	183.09 ± 11.70^{c}
Calcium (mg/dl)	9.18±0.28	8.26±0.57	8.75±0.22	9.17±0.47
Phosphorus (mg/dl)	9.21±0.22	10.45±0.59	9.09±0.28	9.60±0.39
Magnesium (mEq/L)	3.87 ± 0.12^{ab}	3.12 ± 0.20^{a}	3.62 ± 0.12^{a}	4.18 ± 0.11^{b}
Zinc (ppm)	1.14±0.14	1.00±0.08	1.09±0.06	1.05±0.05
Iron (ppm)	3.55±0.14	3.44±0.35	3.86±0.21	4.61±0.30
Copper (ppm)	0.89 ± 0.04^{ab}	0.84 ± 0.04^{a}	1.10 ± 0.06^{b}	0.75 ± 0.04^{a}
Cobalt (ppm)	0.15 ± 0.01^{b}	0.11 ± 0.02^{a}	0.08 ± 0.01^{a}	0.12 ± 0.01^{ab}
Manganese (ppm)	0.13±0.01	0.11±0.02	0.11±0.01	0.12±0.02

Means bearing common superscript within the row do not differ significantly.

while repeat breeders and normal cyclic buffaloes were in oestrus when sampled. Present findings corroborated with the reports of Dhabale and Sharma (2004). Sharma et al. (1999) recorded plasma P4 values of 0.46±0.00, 0.54± 0.01 and 0.18±0.07 ng/ml in anoestrus, suboestrus and normal cyclic buffaloes, respectively. Roussel et al. (1977), however, failed to establish any relationship of plasma P4 level with reproductive status. Progesterone in cyclic animals acts as a regulator of dioestrus period, because as soon as corpus luteum fails to secrete progesterone, development of follicles begins leading to pro-oestrus phase.

The serum total protein content in normal cyclic buffaloes at oestrus was significantly (P<0.05) higher than that in anoestrus, suboestrus and repeat breeding buffaloes, which did not vary significantly. These findings are in close agreement with the reports of Amanullah et al. (1997) and Kumar et al. (2007). In contrast, Latif et al. (1993), Lodhi et al. (1998) and Singh et al. (2004) reported higher plasma total protein level in postpartum anoestrus/repeat breeder than the normal cyclic buffaloes, while Sharma et al. (1998) reported significantly (P<0.05) lower plasma total protein in normal cyclic and anoestrus than the suboestrus buffaloes (6.65±0.06 and 6.37±0.04 vs 7.28±0.20 g/dl). Present findings suggest that the buffaloes with all three reproductive disorders were deficient in plasma total protein.

The serum total cholesterol was significantly (P<0.01) lower in anoestrus and repeat breeding buffaloes as compared to suboestrus and normal cyclic ones. Moreover, repeat breeders had significantly lower total cholesterol than the anoestrus buffaloes, probably due to its poor or non-utilization in steroid hormone synthesis. Many previous reports in cattle and buffaloes (Amanullah et al., 1997; Sharma et al., 1998; Singh et al., 2004; Patel et al., 2007) have also documented significantly lower serum/plasma total cholesterol in anoestrus/repeat breeder animals as compared to normal cyclic ones. Cholesterol is the most important sterol and essential precursor for steroid hormone synthesis in testis, ovary and adrenal cortex. It is an essential component of the cell, and a constituent of plasma lipoproteins, which are involved in the lipid transport system of the body.

The serum calcium levels of anoestrus and normal cyclic buffaloes were non-significantly higher as compared to those of suboestrus and repeat breeding buffaloes, while serum phosphorus was insignificantly higher in suboestrus animals as compared to all other categories (Table 1). These findings corroborated with the report of Kalita et al. (1999). However, identical serum/plasma calcium levels and significantly higher inorganic phosphorus in normal cyclic as compared to anoestrus buffaloes have been reported earlier by some researchers (Amanullah et al., 1997; Patel et al., 2007), though no such difference was noticed in the present study for the inorganic phosphorus levels. Lodhi et al. (1998) and Singh et al. (2005) also recorded significantly higher calcium and/ or phosphorus in normal cyclic than the anoestrus and repeat breeding buffaloes. The role of calcium in sensitizing the tubular genitalia for the action of hormones is well established. Calcium deficiency can upset the normal reproduction possibly due to lack of tone of uterine muscle. The presence of minerals in blood depends on their level in the soil on which the fodder is grown.

The serum magnesium content of normal cyclic buffaloes was significantly (P<0.05) higher than that of all three categories of infertile animals, which did not differ significantly (Table 1). Kalita et al. (1999) recorded significantly (P<0.05) higher serum magnesium in normal cyclic than in repeat breeders as well as anoestrus cows. Sharma et al. (1999), however, reported that there was no significant difference in the serum levels of magnesium at oestrus in buffaloes with regular oestrous cycle and those in anoestrus or suboestrus condition, while Latif et al. (1993) found higher value in anoestrus than the normal cyclic buffaloes (4.48±0.38 vs 3.90±0.16 mEq/L). Present findings depicted the role of magnesium in normal reproductive rhythm in buffaloes.

The serum trace minerals studied (Table 1), zinc, iron and manganese content did not differ significantly among different groups of infertile and normal cyclic buffaloes. However, the serum copper level was significantly (P<0.05) higher and cobalt was lower in repeat breeders as compared

to anoestrus, suboestrus and even normal cyclic buffaloes. These findings to some extent corroborated with the report of Sharma et al. (1999). However, Hedaoo et al. (2008) recorded significantly higher values of all trace elements in normal cyclic than the anoestrus, suboestrus and repeat breeding buffaloes, while Manickam et al. (1977) found significantly higher zinc level in regular breeders than repeat breeders (2.75±0.07 and 2.18±0.17 g/ml), and similar was the trend for iron, manganese and copper. Singh et al. (2006) found lower zinc, copper and cobalt in repeaters than the normal cyclic buffaloes.

From the present findings and the available literature, it is observed that there is no clear consensus about the macro-micro minerals profile of fertile and infertile animals. This may be due to number of variables involved such as breed, age, reproductive status, soil, plant and nutritional status, feeding practices, instruments, assay technique and others. However, majority of the reports suggest certain level of nutrient deficit in infertile as compared to fertile/normal cyclic animals. The present findings suggested the importance of the above elements in maintaining normal reproductive rhythm of buffaloes.

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