



Serum 17 β - oestradiol, progesterone and cortisol level during biological stress period of normal and sub-oestrous cycles of crossbred cattle of Asom

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ABSTRACT

The study was planned to compare serum 17 β - oestradiol, progesterone and cortisol level during biological stress period of normal and sub-oestrous cycles of crossbred cattle of Asom. Jugular blood samples were collected from ten normal cyclic and ten sub-oestrous cows on day 0, 5, 10, 15 and 20 of cycles for the present study. These 3 hormones were estimated by using radioimmunoassay technique. Both 17 β - oestradiol and progesterone concentrations in serum were varied significantly ($P < 0.01$) between days of oestrous cycles of normal and sub-oestrous conditions. But these levels were not varied significantly between the two types of cyclic cows of the investigation where lowest level of progesterone with concomitant highest level of 17 β - oestradiol were recorded on the day of oestrus. On the other hand, highest concentration of progesterone with lowest concentration of 17 β - oestradiol were found on the day 15 of cycles of the both groups. The mean levels of cortisol varied significantly between days of cycles with highest level on the day of oestrus with no significant variation 2 groups of cows.

Key words: Cattle, Cortisol, Normal oestrous cycle, Progesterone, Sub-oestrous cycle, 17 β - Oestradiol

The blood progesterone levels directly reflects cyclicity of ovary while 17 β - oestradiol reflects follicular condition of animals and cortisol is considered to be indicator of biological stress (Cole and Cupps 1977, Rao and pandey 1981, Lyimo *et al.* 2007) where high milk production and manifestation of reproductive cycles might be associated with oxidative stress (West 2003). Hence, it was felt that there is paucity of information in regards to simultaneous modulation pattern of these 3 hormones in high yielding crossbred cattle during normal and sub-oestrous cycles. Therefore, the present study was carried out to compare the modulation of these 3 hormones in serum of crossbred cattle of Asom during oestrous cycles of normal and sub-oestrous cows.

MATERIALS AND METHODS

Blood samples were collected from 10 identified normal cyclic and 10 sub-oestrous cows at day 0, 5, 10, 15 and 20 (day 0 of the next cycle). Estimation of serum 17 β -oestradiol, progesterone and cortisol were done by using

radioimmunoassay kits. The result were analyzed according to Snedcor and Cochran (1994) for comparison and interpretation.

RESULTS AND DISCUSSION

The concentration of serum 17 β - oestradiol, progesterone and cortisol in normal cyclic and sub-oestrous cows on day 0, 5, 10, 15 and 20 are presented in Table 1. Both the 17 β -oestradiol and progesterone concentrations in serum varied significantly ($P < 0.01$) between days of both the types of cyclic cows of the present study. But no significant variation was noticed between groups of cyclic cows. The critical difference test indicated that the 17 β -oestradiol was significantly highest with lowest serum progesterone level on the day of oestrus of cycles of the study when reversal variation of steroids being highest concentration of 17 β - oestradiol with lowest progesterone were recorded on day 0 and 15 of cycles (Figs 1-3). Similar cyclic variation of steroids were reported by some others (Dorbrwolski *et al.* 1968, Dorbrwolski *et al.* 1973, Kang *et al.* 1994, Shukla *et al.* 2000, Bhuyan *et al.* 2004, Deka *et al.* 2007). It will be right to mention that as like that of the present findings a high correlation between oestradiol concentration and oestrous behavior reported (Lyimo *et al.* 2007) when oestrogen level reached peak level at the time of peak standing oestrous signs as like that of Cole and Cupps (1977). But Nakao

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Table1. Level (mean $\pm$ SE) of different biochemical constituents of blood in normal oestrous and sub-oestrous crossbred cattle of Asom at different days of oestrous cycle

Parameter	Types of cycle	Days of oestrous cycle				
		Day 0	Day 5	Day 10	Day 15	Day 20
17 β - Estradiol (pg/ml)	Normal cyclic	38.89 $\pm$ 4.01 ^a	20.36 $\pm$ 1.92 ^b	13.80 $\pm$ 1.42 ^{bc}	12.73 $\pm$ 1.24 ^b	38.68 $\pm$ 3.55 ^a
	Sub-oestrus	40.63 $\pm$ 2.69 ^a	19.45 $\pm$ 2.15 ^b	14.10 $\pm$ 1.15 ^{bc}	12.15 $\pm$ 0.89 ^b	41.50 $\pm$ 3.08 ^a
Progesterone (ng/ml)	Normal cyclic	0.45 $\pm$ 0.70 ^a	2.14 $\pm$ 0.30 ^b	3.74 $\pm$ 0.66 ^c	6.74 $\pm$ 0.96 ^d	0.47 $\pm$ 0.06 ^a
	Sub-oestrus	0.43 $\pm$ 0.05 ^a	4.13 $\pm$ 1.76 ^b	3.66 $\pm$ 0.62 ^b	7.40 $\pm$ 0.90 ^b	0.48 $\pm$ 0.06 ^a
Cortisol (nM/litre)	Normal cyclic	26.20 $\pm$ 2.58 ^a	20.80 $\pm$ 1.63 ^b	21.30 $\pm$.69 ^b	21.30 $\pm$ 1.23 ^b	28.60 $\pm$ 4.63 ^a
	Sub-oestrus	26.40 $\pm$ 2.59 ^a	21.60 $\pm$ 0.97 ^b	23.20 $\pm$.55 ^b	22.50 $\pm$ 1.11 ^b	26.95 $\pm$ 1.95 ^a

* Significant at 5% level and ** significant at 1% level. Means bearing common superscripts in a row do not differ significantly.

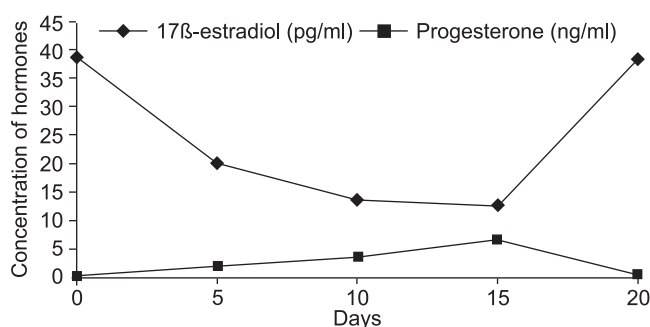
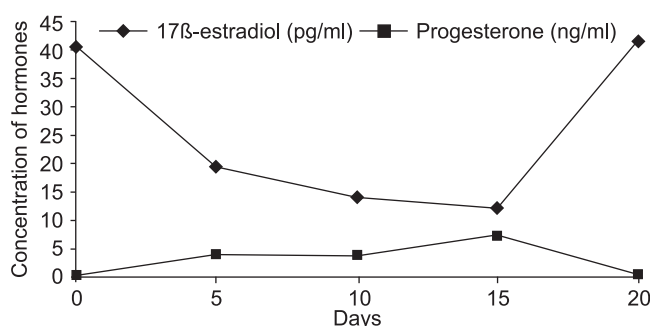
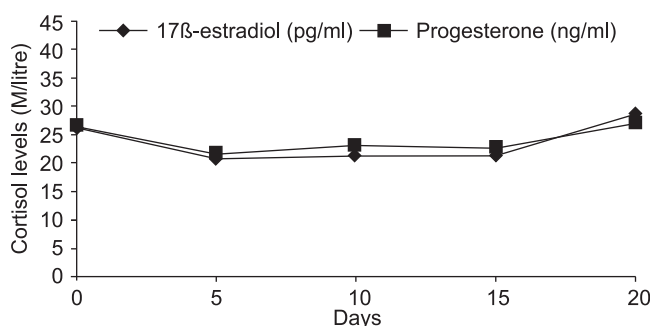
Fig. 1. Variation of serum 17 β -estradiol and progesterone levels of crossbred cattle of Asom during normal oestrous cycle.Fig. 2. Variation of serum 17 β -estradiol and progesterone levels of crossbred cattle of Asom during sub-oestrous cycle.

Fig. 3. Variation of serum cortisol levels of crossbred cattle of Asom during cycles of normal oestrus and sub-oestrous cows.

et al. (1983a) said that the cows with serum progesterone level above 2ng/ml at mid luteal phase could be considered as normal. In agreement to the present result Stevenson (1997) also opined that the presence of corpus luteum associated with increase concentration of progesterone when oestrogen level was varied towards mid luteal stages in cows. Chauhan (1980) reported comparatively higher progesterone level during luteal phase of sub-oestrous than the normal cyclic buffaloes. But the present study revealed no significant difference of progesterone levels during normal and sub-oestrous cycles of crossbred groups of cows.

The mean serum concentration of cortisol values varied significantly ($P < 0.05$) between days with no significant variation between cows of normal and sub-oestrus cycles. The critical difference test revealed that the cortisol level was significantly higher on the day 0 and 20 in both normal cyclic and sub-oestrous cows. The pattern of changes of cortisol levels in both types of oestrous cycle was in agreement with findings of few workers with higher values at or around oestrus (Rao and Pandey 2008, Singh *et al.* 2008). The variation of levels of cortisol at oestrus might be due to biological stress factors like restlessness with wide range of body activities (McDonald 1980). In this connection Tanaka *et al.* (2008) observed that there was relationship between milk production and oxidative stress markers concentration in plasma with concomitant variations of oestrogen, progesterone and cortisol during the time of onset of oestrus (Walker *et al.* 2008) and the low levels of this hormone in serum during luteal and follicular phases of cycles of the present study might be reflection of adaptation to the environment and some mechanisms to prevent high metabolic heat (Adeyemo *et al.* 1981). However, it could be concluded that the significant difference of the mean values of 17 β -estradiol, progesterone and cortisol concentration in serum at different days of normal and sub-oestrous cycles was due to specific type of cyclic cows of the present study.

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