

## Serum progesterone and estradiol levels in Jafarabadi buffaloes

Y. G. DUGWEKAR<sup>1\*</sup>, N. P. SARVAIYA<sup>2</sup>, M. D. PATEL<sup>3</sup>, K. R. TAJNE<sup>4</sup> and R. R. SHAH<sup>5</sup>

Reproductive Biology Research Unit

Anand Agricultural University, Anand-388 110, Gujarat.

### ABSTRACT

The present study reports circulating serum progesterone ( $P_4$ ) and estradiol-17 $\beta$  ( $E_2$ ) levels during different phase of reproduction, viz, puberty, oestrous cycle, pregnancy, parturition and post-partum period in Jafarabadi buffaloes. The level of  $P_4$  and  $E_2$  in pre-pubertal ( $n=7$ ) Jafarabadi buffaloes were in the range of  $0.07 \pm 0.02$  to  $1.90 \pm 0.57$  ng/ml and  $24.85 \pm 11.80$  to  $76.0 \pm 4.88$  pg/ml respectively. At estrus ( $n=6$ ), the basal level of  $P_4$  was  $0.55 \pm 0.22$  ng/ml, increased to  $2.90 \pm 0.46$  ng/ml during diestrus and remained elevated ( $3.23 \pm 0.16$  ng/ml) in conceived animal during first trimester of gestation. The peak  $E_2$  at estrus ( $n=6$ ) was  $40.20 \pm 19.68$  pg/ml, which fell below  $10.00$  pg/ml for rest of the estrus cycle. The  $E_2$  concentration also remained elevated through out the gestation period and reached at peak of  $129.33 \pm 33.38$  pg/ml towards parturition. During purperium ( $n=10$ ), up to three months the serum  $P_4$  and  $E_2$  levels remained at a basal level indicating very little ovarian activity. In some animals post partum onset of estrus was delayed up to ten months. These animals had only basal levels of  $P_4$  and  $E_2$  and complete inactive ovaries. From this study, it can be concluded that the values with respect to serum  $P_4$  and  $E_2$  levels at different phases of reproduction in Jafarabadi buffaloes are similar to the values reported for other breeds of buffaloes.

**Key Words:** Progesterone, Estradiol, Jafarabadi buffalo, Reproduction.

### INTRODUCTION

Amongst the three well defined breeds of buffaloes of Gujarat, Jafarabadi is an important breed for dairy industry having a population of 53.10 lakhs Anonymous (1992). Because of its good milk producing ability of 2000 liters per lactation, very high fat content of 8.5 per cent, and large fat globules in the milk, it has its own economic importance among livestock owners. However, its delayed sexual maturity, longer inter-calving periods and poor reproductive efficiency need special attention (Ranjhan and Pathak, 1993). The present study reports data on the circulating serum  $P_4$  and  $E_2$  concentration during different phases of reproduction to provide basic norms as an aid to improve reproductive efficiency in this breed.

### MATERIALS AND METHODS

Physically healthy Jafarabadi buffaloes maintained under standard feeding and

\*Correspondence: 90- Panchmukhi Society, Nr. Sriram Eng. College, Madhotal, Jabalpur - 482002. Mob.: 9893101016, e.mail: ygdugwekar@yahoo.com

1. Head, Reprod. Biol. Res. Unit (Retd.), 2. Assistant Research Scientist. 3. Jr. Research Fellow. 4 and 5, Research Scientists.

managerial practices at the livestock research station, Gujarat Agricultural University, Junagadh, were selected on the basis of clinical examination of the genitalia. The experimental animals were closely observed for their reproductive events, such as puberty ( $n=7$ ), estrus cycle ( $n=6$ ), gestation and parturition ( $n=6$ ), post-partum period ( $n=10$ ) and post partum an-estrus ( $n=6$ ).

The blood samples were collected and serum was preserved at  $-20^{\circ}$  C temperature till analyzed. Progesterone ( $P_4$ ) and Estradiol 17 $\beta$  ( $E_2$ ) were estimated by standard RIA technique of Kubasic *et al.* (1984) and Robertson *et al.* (1979), respectively, using radioimmunoassay kits (DPC, USA and immunotech, France, respectively). The data were statistically analyzed as per Snedeco and Cochran (1968).

### RESULTS AND DISCUSSION

#### Puberty:

The age of puberty in Jafarabadi buffaloes has been reported to be 36 months (Patel *et al.* 1999), 29-34 months in Murrah buffaloes (Basu *et al.* 1984), 40 months in Nagpuri buffaloes

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The  $P_4$  level remains at 0.07 to 1.9 ng/ml while  $E_2$  levels were somewhat higher at  $24.85 \pm 11.80$  to  $76.00 \pm 4.88$  pg/ml (Table-1) indicating that the follicular activity of the ovary might have initiated earlier but the ovulatory surge of L.H., ovulation and luteinization might be absent and the regular onset of estrus cycles took place at a later age.

Table 1: Estradiol and progesterone levels in pre-pubertal Jafarabadi buffaloes.

Age (Months)	$P_4$ (ng/ml) (n=7)	$E_2$ (pg/ml) (n=7)
20.0	$0.09 \pm 0.03$	$54.14 \pm 2.55$
20.5	$0.14 \pm 0.02$	$76.00 \pm 4.88$
21.0	$0.41 \pm 0.18$	$47.57 \pm 7.00$
21.5	$0.20 \pm 0.11$	$49.28 \pm 4.69$
22.0	$0.16 \pm 0.04$	$50.85 \pm 6.35$
22.5	$0.45 \pm 0.08$	$38.85 \pm 6.85$
23.0	$0.07 \pm 0.02$	$41.42 \pm 6.15$
23.5	$1.66 \pm 0.83$	$24.85 \pm 11.80$
24.0	$0.33 \pm 0.08$	$25.07 \pm 2.54$
24.5	$1.90 \pm 0.57$	-

#### Estrous cycle:

The levels of  $P_4$  and  $E_2$  on day one (estrus), day 7, 14, and 21 of estrous cycle are shown in Table 2. It was observed that  $0.55 \pm 0.22$  ng/ml  $P_4$  and  $40.20 \pm 19.68$  pg/ml  $E_2$  levels were recorded on the day of estrus. Subsequently, the  $P_4$  level rose to  $2.90 \pm 0.46$  ng/ml till Day 14 and remained elevated up to Day 21. These could be because of either prolonged estrous cycle or because of conception in some animals, indicating presence of functional corpus luteum. The length of estrous cycle in Surti buffalo is reported to be 21-22 days (Jankiraman and Mehta, 1988) and 18 to 28 days in swamp buffaloes (Phillips *et al.*, 1945). Basal  $E_2$  levels remained lower than 10 pg/ml through out the estrous cycle. These findings are in agreement with the earlier reports on Surti buffaloes (Jankiraman and Mehta, 1988). Peak  $P_4$  values on day 13 to 15 of diestrus phase have been reported to be around 5 ng/ml in Murrah buffaloes (Ahmed *et al.*, 1977; Raizada *et al.*, 1977; Batra *et al.*, 1979). Takkar and Singh (1980) reported 35 to 80 pg/ml  $E_2$  peak on the day of estrus in Murrah buffaloes. Jain and Pandey (1987) reported  $0.3 \pm 0.1$  and  $4.0 \pm 2.6$

ng/ml  $P_4$  on day 0 and day 11 of estrous cycle, respectively, in Murrah buffaloes. These variations could only be assigned to breed differences, as the basic pattern of  $P_4$  and  $E_2$  levels in all the breeds through out the estrous cycle remained almost similar.

Table 2. Estradiol and progesterone levels during estrous cycle in Jafarabadi buffaloes.

Days of estrous cycle	$P_4$ (ng/ml) (n=6)	$E_2$ (pg/ml) (n=6)
1	$0.55 \pm 0.22$	$40.20 \pm 19.68$
7	$0.50 \pm 0.14$	$2.07 \pm 1.67$
14	$2.90 \pm 0.46$	$5.30 \pm 2.02$
21	$2.90 \pm 0.10$	$8.66 \pm 5.01$

#### Pregnancy and Parturition:

The pooled data of  $P_4$  and  $E_2$  for first second and third trimester of pregnancy are presented in Table-3. Higher levels of  $P_4$  ( $3.23 \pm 0.16$  ng/ml) and low levels of  $E_2$  ( $10.00 \pm 4.54$  pg/ml) were observed during the first trimester of pregnancy. The levels of  $E_2$  observed throughout gestation indicated a continuous follicular growth on the ovary and could also be responsible for the gestational estrus observed in some animals (Danell, 1987). Mc.Donald (1987) also suggested extra ovarian source of  $E_2$  contributing to high level of  $E_2$  in circulation. High  $P_4$  levels during pregnancy is a result of functional CL (Ketenback and Dun, 1980). Similar findings were reported by Ahmed *et al.* (1977) and Batra *et al.* (1979) in Murrah buffaloes.

Table 3. Estradiol and progesterone levels during pregnancy in Jafarabadi buffalo.

Trimester	$P_4$ (ng/ml) (n=6)	$E_2$ (pg/ml) (n=6)
First	$3.23 \pm 0.16$	$10.00 \pm 4.54$
Second	$1.93 \pm 0.35$	$43.43 \pm 18.36$
Third	$2.93 \pm 0.51$	$101.53 \pm 32.79$
Parturition	$1.81 \pm 0.59$	$129.33 \pm 33.38$

High  $P_4$  level were maintained through out the gestation, started declining towards parturition ( $1.81 \pm 0.59$  ng/ml), coinciding with increasing concentration of  $E_2$  ( $129.33 \pm 33.38$  pg/ml) (Table-3). Increasing  $E_2$  towards

increasing concentration of  $E_2$  ( $129.33 \pm 33.38$  pg/ml.) (Table-3). Increasing  $E_2$  towards parturition triggers prostaglandin secretion, which in turn would cause myometrial contractions and facilitate parturition process. (Fairclough, *et al.*, 1978). Such trend around parturition was also observed in Murrah and Surti buffaloes (Lohan *et al.* 1987 and Sarvaiya *et al.* 1993).

#### Puerperium:

After parturition the involution of uterus begins and ovarian activity appears to be minimal during this period, probably due to lactational stress or the refractory nature of the ovary to the action of gonadotropins. This is reflected in lower  $P_4$  and  $E_2$  concentrations in the circulation (Table 4). The onset of first post-partum heat and service period are longer in suckled and high yielding buffaloes (Tiwari, 1989). In Jafarabadi breed the service period and calving interval were 7 months and 18.4 months, respectively (Anonymous, 2001).

Table 4. Estradiol and progesterone levels during puerperium in Jafrabadi buffaloes.

Days post partum	$P_4$ (ng/ml) (n=10)	$E_2$ (pg/ml) (n=10)
0 - 20	$0.17 \pm 0.03$	$34.56 \pm 13.46$
21 - 40	$0.51 \pm 0.13$	$28.44 \pm 6.36$
41 - 60	$0.25 \pm 0.09$	$10.88 \pm 6.21$
61 - 80	$0.87 \pm 0.46$	$10.73 \pm 4.26$

#### Post-partum anoestrus:

The post-partum anoestrus, when extended to six months or more is known as prolonged anoestrus or up to one year known as dead anoestrus (Roberts, 1971). Many workers have reported a very high incidences of anoestrus in various breeds of buffaloes in field condition or at organized dairy farm (Luktuke and Sharma, 1978; Roychowdhary and Benerjee, 1985 and Janakiraman and Mehta, 1988). Low concentrations of  $P_4$  and  $E_2$  were found up to ten months post-partum in Jafarabadi buffaloes in the present study (Table 5) and the ovaries remained smooth and inactive. Similar results were reported by Narayana, *et al.* (1984), Madan (1987) and Jain and Pandey (1987) in Murrah buffaloes. From this study it can be concluded that the values with respect to serum  $P_4$  and  $E_2$  levels at different phases of reproduction in

Jafarabadi buffaloes are similar to the values reported for other breeds of buffaloes.

Table 5. Estradiol and progesterone levels during post-partum anoestrus in Jafrabadi buffaloes.

Months post partum	$P_4$ (ng/ml) (n=6)	$E_2$ (pg/ml) (n=6)
Four	$0.66 \pm 0.33$	$12.73 \pm 5.12$
Five	$0.88 \pm 0.34$	$5.00 \pm 2.54$
Six	$0.40 \pm 0.19$	$5.22 \pm 2.35$
Seven	$0.71 \pm 0.36$	$8.00 \pm 3.92$
Eight	$1.23 \pm 0.50$	$8.37 \pm 2.40$
Nine	$0.51 \pm 0.23$	$7.77 \pm 4.01$
Ten	$0.95 \pm 0.40$	$7.73 \pm 4.66$

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