SEASONAL ALTERATION IN THE SERUM PROLACTIN AND LH LEVELS IN THE WATER BUFFALOES

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ABSTRACT

It has been established that buffaloes come to heat during summer months (low breeding period) but do not exhibit clear cut heat symptoms. Because of this, many good animals remain unmated during summer. Hence, it was felt essential to study the endocrine physiology of buffalo, which is the main dairy animal in this country.

By using radioimmunoassay technique, serum prolactin and LH levels in Surti breed of Indian water buffaloes were determined. Blood samples were collected at specific phases of the estrous cycle throughout the year and the samples were divided into three categories namely, medium breeding (monsoon), peak breeding (winter) and low breeding (summer) periods. Large fluctuations in prolactin activity were observed at different phases of the estrus during monsoon and winter but not in summer.

Specifically, during monsoon and winter seasons a sharp fall in prolactin levels after ovulation was noted.

INTRODUCTION

BUFFALOES come into estrus throughout the year and can be bred any time of the year but reproductive efficiency varies from month to month. Conception was reported maximum (88%) during September to March, whereas it could be as low as 8–10% during summer months. Higher environmental temperature, humidity and effect of excessive sunlight were considered as the main responsible factors, for lowered reproductive activity in buffaloes[1-3]. Observations recorded so far on ovarian activity and other biological parameters indicated that the failure of breeding during summer in buffaloes appeared to be mainly an endocrine problem[4-5] and this warrented the study of the LH and prolactin levels during different seasons.

MATERIALS AND METHODS

The average length of the estrous cycle in Surti breed of buffaloes is around 19 to 21 days. Blood samples were collected from 12 buffaloes throughout the year at 6–7 a.m. on the specific days of estrus cycle as indicated in Table I. The different nomenclatures used in the study for different breeding periods are also included in this table. Serum prolactin and serum LH levels were determined by radioimmunoassays using double antibody technique developed by Midgley[6].

The prolactin values are expressed with reference to the standard hormone preparation from batch number 11 supplied by National Institutes of Health, USA, briefly expressed as NIH-P-S-11 while the LH values are expressed with reference to the standard hormone preparation from batch number 18 supplied by National Institutes of Health, USA, briefly expressed as NIH-LH-S-18. Specificity of the antisera used was checked for cross-reaction with other hormones. The reference preparations of LH and prolactin utilised for radioimmunoassays were kindly supplied by NIAMD, NIH, USA.

TABLE I

Details of different nomenclatures used

H_1	Beginning of estrus
H_2	End of estrus, close to ovulation
D_9	Day 9 of the estrus (luteal phase)
D_{15}	Day 15 of the estrus (follicular phase)
P_1	Medium breeding period (Monsoon)
P_2	Peak breeding period (Winter)
P_3	Low breeding period (Summer)

RESULTS

It is evident from Fig. 1, in low breeding season, that the prolactin levels are 2 to 6 fold higher throughout estrus cycle as compared to medium and peak breeding seasons. It is interesting to note that during both peak and medium breeding

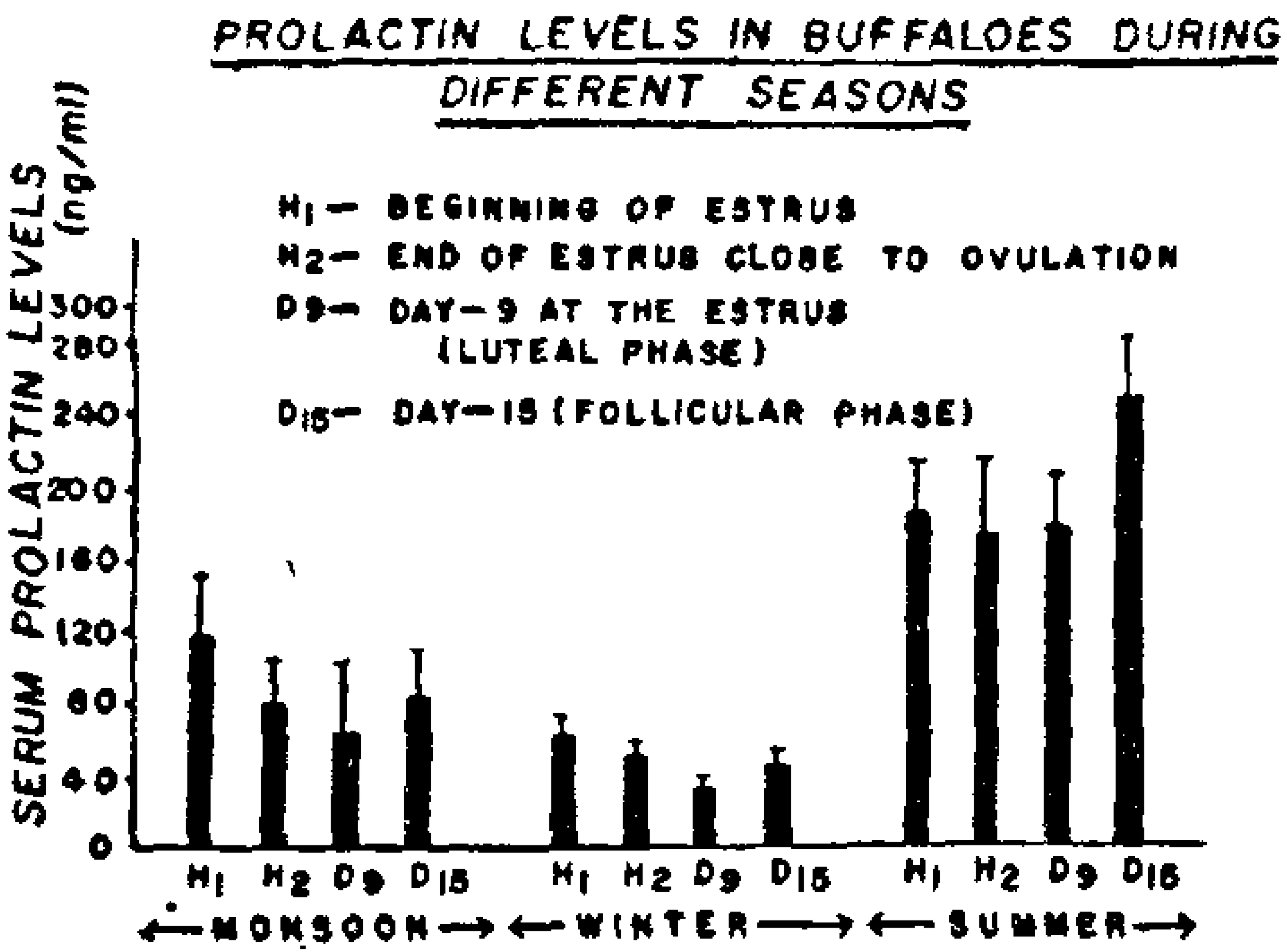

FIG. 1

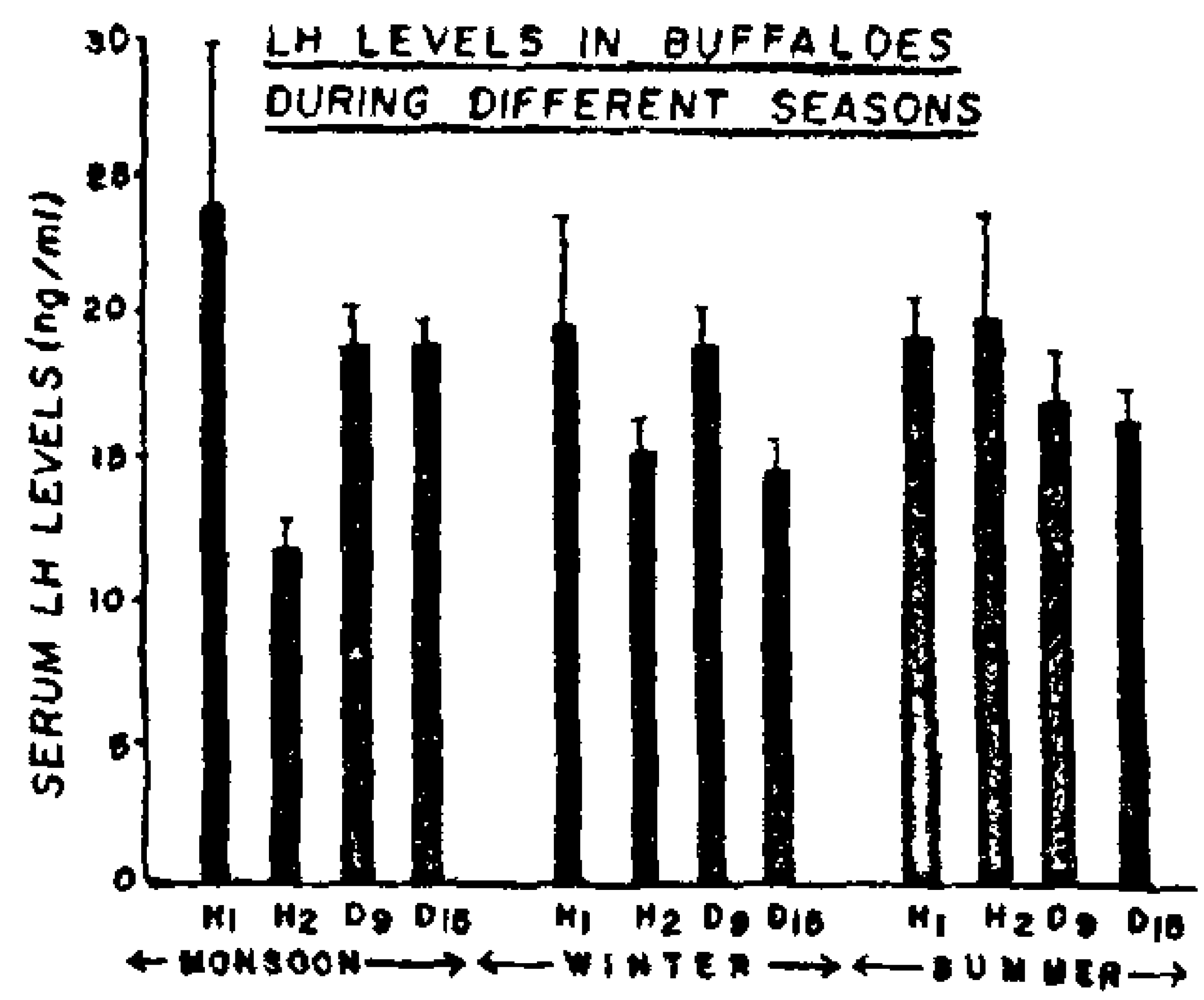

FIG. 2

seasons there is a sharp fall in prolactin levels after ovulation. Lowest prolactin levels are observed in luteal phase. In low breeding season, no lowering of prolactin levels on day 9 is noticed; but a sharp rise is seen on day 15 (follicular phase). These results are given in Table II.

TABLE II

	Period means for prolactin (ng/ml)				
	H_1	H_2	D_9	D_{15}	$\bar{X}$
P_1	116·78 ±37·5	79·63 ±25·33	64·45 ±28·82	82·84 ±27·46	85·92
P_2	61·40 ±12·46	51·37 ±6·41	35·61 ±6·54	44·16 ±8·01	48·14
P_3	185·54 ±27·91	170·72 ±44 26	176·00 ±24·32	248·94 ±32 68	196·30

P_1 = Monsoon; P_2 = Winter; P_3 = Summer.

In peak and medium breeding seasons highest LH concentrations were evident at the beginning of estrus which decreased on H_2 (end of heat). During low breeding season no marked fluctuations in LH levels were noticeable (Fig. 2 and Table III).

TABLE III

	Period means for LH (ng/ml)				
	H_1	H_2	D_9	D_{15}	$\bar{X}$
P_1	23·9 ±5·7	11·9 ±0·9	19·1 ±1·4	19·2 ±0·7	18·52
P_2	19·8 ±3·7	15·3 ±1·2	19·1 ±1·2	14 8 ±1·0	17·25
P_3	19·5 ±1·2	20·0 ±3·6	17·0 ±1·8	16·5 ±1·1	18·25

P_1 = Monsoon; P_2 = Winter; P_3 = Summer.

DISCUSSION

Major environmental factors controlling the hypothalamo-pituitary-gonadal axis are[1]:

(1) Photoperiod; (2) Temperature; (3) Rainfall.

Of these, length of the photoperiod is of primary importance, whereas temperature, rainfall, etc., are of secondary importance. It is well known that the function of pineal gland is under the control of day length. Recently Blask *et al.*[7] have reported prolactin, the inhibiting and releasing factor activities in the bovine, rat and human pineal glands. It appears that pineal gland may serve as an alternate or supplemental source of PRF and PIF. High levels of prolactin observed by us in low breeding season (summer) may be due to the influence of photoperiod on the pineal gland activities of prolactin controlling factors. Schamas[8] have also reported high levels of prolactin during summer months in cattle. Wettemann and Tucker[9] have also shown that serum prolactin levels were directly related to ambient temperature.

Considerable data are being accumulated recently that high prolactin levels could interfere with estrous cycle and fertility. This effect could be at ovarian hypothalamus level. Prolactin could directly affect ovarian steroidogenesis by altering the number of LH receptors. It has been suggested that prolactin may block the hypothalamic mechanism responsible for the episodic release of LH and also inhibit the positive feedback of estrogen on LH secretion.

From the results of our study it appears that summer sterility observed in buffaloes could be due to persistently high levels of prolactin during the cycle and the control of mechanisms which lowers prolactin could restore fertility as has been observed in hyperprolactinemic women[10-11].

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