

## STUDY ON BLOOD BIOCHEMICAL PARAMETERS OF LACTATING MARATHWADI BUFFALO

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### ABSTRACT

The present investigation was undertaken to know some blood biochemical constituents in lactating Marathwadi buffaloes. Blood samples from the lactating buffaloes were analyzed for blood glucose and serum constituents such as total protein, urea nitrogen, total lipid, cholesterol, calcium, phosphorus, sodium, potassium and chloride.

The mean values of blood and serum biochemical constituents in group first, second and third respectively, were as follows: Blood glucose  $52.87 \pm 1.78$ ,  $52.92 \pm 1.63$  and  $63.12 \pm 1.92$  mg/dl, Serum total protein  $7.76 \pm 0.10$ ,  $7.28 \pm 0.15$  and  $7.19 \pm 0.21$  g/dl, urea nitrogen  $16.51 \pm 0.59$ ,  $16.05 \pm 0.60$  and  $14.82 \pm 0.34$  mg/dl total lipid  $1.68 \pm 0.03$ ,  $1.65 \pm 0.02$  and  $1.64 \pm 0.03$  g/dl, cholesterol  $112.34 \pm 1.38$ ,  $104.57 \pm 2.04$  and  $103.56 \pm 2.28$  mg/dl, calcium  $9.81 \pm 0.9$ ,  $10.2 \pm 0.08$  and  $9.49 \pm 0.13$  mg/dl, phosphorus  $4.32 \pm 0.11$ ,  $4.02 \pm 0.07$  and  $3.67 \pm 0.01$  mg/dl, sodium  $143.90 \pm 2.88$ ,  $147.50 \pm 3.33$  and  $151.00 \pm 1.43$  mEq/L, potassium  $7.86 \pm 0.51$  and  $7.27 \pm 0.61$  mEq/L, chloride  $96.26 \pm 1.61$ ,  $98.03 \pm 1.98$  and  $98.62 \pm 1.73$  mEq/L.

Among blood constituents highly significant differences ( $P < 0.01$ ) existed in group

mean of blood glucose, serum total protein, total cholesterol, calcium and phosphorus whereas serum urea nitrogen, total lipid, sodium and potassium and chloride differed non-significantly.

**Keywords:** Marathwadi buffalo, blood biochemical parameter, lactating, serum, India

### INTRODUCTION

India is the home of best breeds of buffaloes in the world. Buffaloes contribute more than half of total milk production in country. Some buffalo breeds are high milk producers Murrah, *Nili Ravi*, Mehsana, Jaffrabadi and Surti are the best milk producing breeds. In comparison to the above mentioned Indian dairy buffalo breeds the average total milk production of 1172 Liters and fat percentage of 8.24% as reported by Gujar *et al.* (2000) in Marathwadi buffaloes is very closer to the recognized buffalo breed of India.

Marathwadi buffaloes are reared in Nanded, Latur, Beed, Parbhani, Hingoli, Osmanabad, Jalna and Aurangabad districts of Maharashtra state due to genetic potential for milk and adaptation to local environmental conditions. Lactation is much more

energy expensive than pregnancy. Both homeostatic and homeorhetic mechanisms are required for the lactating animal to maintain metabolic and physiological equilibrium while sustaining a large net energy turn-over. The biochemical constituents have varied functions such as maintenance of acid base balance, maintenance of membrane potential, permeability of cell membrane, neuro-muscular excitability, regulation of colloidal osmotic pressure, flow of tissue fluids, absorption of nutrients etc. All these normal functions of healthy animals are essential for homeostasis. Any variation in minerals in blood is an indication of disease condition and precisely used as a diagnostic tool in different metabolic disorders and mammary infections. (Zagoevski, 1983). Looking into the world Scenario of buffalo as well as at National level and particularly in Marathwada region and considering the functional importance of blood constituents it was felt highly essential to study the blood constituents and their correlation in lactating Marathwadi buffaloes as the preview of literature indicated that this type of study was not performed on the lactating Marathwadi buffaloes, therefore the present investigation was conducted.

## MATERIALS AND METHODS

The present estimations were carried out at the Department of Physiology and Biochemistry, College of Veterinary and Animal Sciences, MAFSU, Parbhani. The experiment was conducted during March to June 2001. The study includes certain blood Biochemical constituents in the three groups of Marathwadi buffaloes.

The experimental animals selected from different villages randomly around Parbhani city.

The animals were categorized according to the stage of lactation into three groups each group ten animals as:

- Group 1: First lactation,
- Group 2: Second lactation and
- Group 3: Third lactation

Blood samples (15 ml) from the Jugular vein of experimental animals were collected in the morning hours. And about 3ml blood in glass vials with anticoagulant (EDTA). The whole blood sample was immediately deprotenised by Folin and Wu methods as described by Oser (1965) to avoid loss of blood glucose milk samples were collected in large size (50 ml capacity) plastic bottles for estimation of physico-chemical constituents. The blood samples were carried in ice to the laboratory for further processing.

Serum was separated from blood samples within 4 to 5 h. of collection and stored at -20°C until further analyses. The whole blood samples were immediately used for estimation of blood glucose.

The blood constituents were analysed by using standard techniques categorized as follows:

1) By spectrophotometry:

I) Blood constituents:

- i) blood glucose,
- ii) serum urea nitrogen,
- iii) serum total protein,
- iv) serum total lipid
- v) serum cholesterol,
- vi) serum calcium and
- vii) serum phosphorus.

2) By flame Emission photometry: A Flame photometer was used for estimation of Sodium and Potassium in blood serum.

3) By Titration: Chloride in blood serum was estimated by titration method.

Blood Glucose was estimated by Folin and Wu method (1920, modified by Oser, 1965). Blood urea was estimated by using berth lot method with modification introduced by Faweett and Scott (1960) Total protein was estimated by using Biuret method.

Serum total lipids were estimated by phosphovanillin method. Serum calcium was estimated by using Trinder's method. Chloride in serum was estimated by using Schales and Schales (1941) method. Serum phosphorus was estimated by modified metol method Serum sodium and potassium were determined by flame photometry as described by Oser (1965). Deionized glass double distilled water was used throughout for analysis of serum electrolytes. The data on constituents of blood samples were analysed by applying completely randomized design for comparasion of graph mean. (Panse and Sukhatme, 1985) Similarly, simple correlation coefficients of dependent variables were also computed.

## RESULT AND DISSCUSSION

The biochemical constituents studied were blood glucose, serum urea nitrogen, total protein, total lipid, total cholesterol, calcium, phosphorus, sodium, potassium and chloride.

### Blood biochemical constituents

#### Blood glucose

The result of analysis of blood glucose is given in Table 1 (Sr. No. 1) which indicates that blood glucose was significantly ( $P<0.01$ ) higher during third lactation ( $63.12\pm1.92$  mg/dl) as compared to first and second stage of lactation. ( $52.87\pm1.78$  and  $52.92\pm1.63$  mg/dl, respectively). These values we higher than values reported by Syed *et al.*

(1990),  $43.7\pm0.98$  mg/dl in Murrah buffaloes and Ramkrishna (1991) values and Jindal and Ludri (1995),  $47.47\pm0.98$  mg/dl,  $48.8\pm2.28$  and  $57.7\pm2.57$  mg/dl in stallfed and grazing lactating Murrah buffaloes, respectively; Bajaj (1993).  $49.24\pm1.60$  mg/dl in anoestrus Surti buffaloes. The observed higher levels of blood glucose during lactation may be due to metabolic adaptation associated with onset of lactation; there is increased glucose production with concomitant reduction in glycogen deposition in liver and muscles. Ruminants have evolved glucose-sparing mechanism to shunt glucose towards lactose production and away from energy production. (Larson, 1985).

#### Serum total protein

Serum total proteins in different groups of lactating Marathwadi buffaloes are given Table 1 (Sr. No. 2) The serum total protein during first lactation was significantly higher ( $P<0.01$ ) than that of second and third lactation. These values were higher than values reported for Indian buffaloes (Lactating,  $6.47\pm0.06$  and dry,  $6.00\pm0.07$  g/dl) Kulkarni *et al.* (1984), Egyptian (7.43 g/dl) and Etalian (7.63 g/dl) buffaloes. The protein anabolic effects of significantly higher level of growth hormone in lactating cows (Bines and Hart, 1978) as compared to dry was probably maintained higher levels of total serum protein in lactating dairy animals as compared to dry animals. Syed *et al.* (1990) reported  $9.76\pm0.18$  g/dl and  $9.14\pm0.17$  g/dl serum total protein in primiparous and pluriparous Murrah buffaloes. These values are higher than the values in Marathwadi buffaloes.

#### Blood urea nitrogen

The average blood urea nitrogen level in first, second and third lactation was  $16.51\pm0.59$ ,  $16.04\pm0.6$  and  $14.82\pm0.34$  mg/dl in Marathwadi

buffaloes. These values are in agreement with values reported by Kulkarni *et al.* (1984) in dry Murrah buffaloes ( $16.15 \pm 0.87$  mg %), however, significantly higher concentration of serum urea nitrogen in lactating buffaloes was reported by Kulkarni *et al.* (1984).

### Serum total lipids

The mean serum total lipids levels were  $1.68 \pm 0.03$ ,  $1.65 \pm 0.02$  and  $1.64 \pm 0.03$  g/dl in first, second and third lactation in Marathwadi buffalo with non-significant variation. These values were higher than compared to values reported by Ambore (1997) in healthy buffaloes.

### Serum total cholesterol

Serum total cholesterol level as depicted in Table 1 (Sr. No. 3) indicate that the values were significantly higher during first lactation showing decreasing trend from first to third lactation. The results of present study corroborate earlier findings of Murthy and Narsimha Rao (1981). They further reported the values for heifers ( $60.51 \pm 2.77$ ), dry buffaloes ( $81.52 \pm 3.92$ ), lactating buffaloes ( $113.16 \pm 10.80$ ). The higher serum total cholesterol level in first lactation than the second and third may be attributed to production stress in first lactation or suppression of thyroid activity by estrogens (Murthy and Narsimha Rao, 1981).

### Serum calcium

Table 1 (Sr. No. 4) illustrate that serum calcium level changes significantly during different lactational stages. The highest level was found in second lactation followed by first and second lactation ( $10.21 \pm 0.08$ ,  $9.81 \pm 0.9$  and  $9.49 \pm 0.13$  mg/dl, respectively). These values are higher than the values reported by Ramkrishna (1991)  $9.77 \pm 0.23$  mg/dl in lactating Murrah buffaloes, Rajivir Singh

*et al.* (1988)  $8.41 \pm 0.51$ ,  $9.18 \pm 0.5$  and  $7.95 \pm 0.42$  mg/dl in lactating Murrah buffaloes and Hafeez Sehba (1994) in lactating buffaloes ( $10.65 \pm 0.32$  mg/dl).

### Serum phosphorus

The serum inorganic phosphorus is presented in Table 1 (Sr. No. 5) indicating decreasing trend from first to third lactation ( $4.32 \pm 0.11$ ,  $4.02 \pm 0.07$  and  $3.67 \pm 0.011$  mg/dl, respectively). These values are lower than values reported by Ramakrishna (1991); Kulkarni *et al.* (1984); Hafeez Sehba (1994). This decreases trend corroborates with the findings of Lane *et al.* (1968) who observed highest phosphorus 6.3 mg percent concentration in young cows as compared to matured one.

### Serum sodium

The mean serum sodium levels during first, second and third lactation were  $143.90 \pm 2.88$ ,  $147.50 \pm 3.33$  and  $151.00 \pm 1.43$  mEq/L, respectively with non-significant variations. This is in agreement with the findings of Soni *et al.* (1982). However, the serum sodium levels were higher than the values reported by Bapat (1981),  $109.14 \pm 7.84$  mEq/L. This variation could be due to nutritional, managerial and agro-climatic factors (Kulkarni *et al.* 1984).

### Serum potassium

The mean potassium levels in lactating Marathwadi buffaloes during different lactation stages varied from  $7.18 \pm 0.04$  to  $7.27 \pm 0.61$  mEq/L. The variation was not statistically significant. This is in agreement with Kulkarni *et al.* (1984) who reported statistically non-significant potassium levels ( $4.59 \pm 0.08$  and  $4.97 \pm 0.22$  mEq/L) in lactating and dry buffaloes, respectively, which are lesser than the values in the present study. Similarly, the values in the present study were also lower than the

Table 1. Blood biochemical parameters in lactating Marathwadi buffaloes.

Sr. No.	Parameter	Unit	Group 1	Group 2	Group 3	Grand mean
1	Blood Glucose	mg/dl	52.87 <sup>a**</sup> ±1.78	52.92 <sup>a</sup> ±1.63	63.12 <sup>b</sup> ±1.92	56.30
2	Total protein (S)	g/dl	7.76 <sup>a**</sup> ±0.10	7.28 <sup>b</sup> ±0.15	7.19 <sup>b</sup> ±0.21	7.41
3	Blood urea nitrogen (S)	mg/dl	16.51±0.59	16.05±0.60	14.82±0.34	15.79
4	Total lipid (S)	g/dl	1.68±0.03	1.65±0.02	1.64±0.03	1.66
5	Cholesterol (S)	mg/dl	112.34 <sup>a**</sup> ±1.38	104.57 <sup>b</sup> ±2.04	103.56 <sup>b</sup> ±2.28	106.83
6	Calcium (S)	mg/dl	9.81 <sup>a**</sup> ±0.9	10.2 <sup>b</sup> ±0.08	9.49 <sup>c</sup> ±0.13	9.84
7	Phosphorus (S)	mg/l	4.32 <sup>a**</sup> ±0.11	4.02 <sup>b</sup> ±0.07	3.67 <sup>c</sup> ±0.01	4.00
8	Sodium (S)	mEq/l	143.90±2.88	147.50±3.33	151.00±1.43	147.47
9	Potassium (S)	mEq/l	7.18±0.44	7.86±0.51	7.27±0.61	7.43
10	Chloride (S)	mEq/l	96.26±1.61	98.03±1.98	98.62±1.73	97.64

<sup>\*\*</sup>(P<0.01) Significantly at 1 % level.

<sup>\*</sup>(P<0.05) Significantly at 5 % level.

values reported by Bapat, (1981) 4.74±0.42 mEq/L.

definite trend with parity of lactation.

### Serum chloride

The serum chloride levels as indicated in Table 1 were 96.26±1.61, 98.03±1.98 and 98.62±1.73 mEq/L respectively, in different lactational stages. These values are similar to values reported by Kulkarni *et al.*, 1984, (97.72 mEq/L), however lower than the values reported by Bapat, 1981 (101.63±0.97 mEq/L); Hafeez Sehba 1994 (111.2±1.31 mEq/L) in lactating buffaloes.

### CONCLUSIONS

From the above study it was concluded that stage of lactation had the effect on blood glucose and serum chloride increased with the advancing lactation number. Also, urea, total protein, total lipid, total cholesterol, calcium, phosphorus and sodium in serum decreased as the lactation number increased. Serum potassium did not show any

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