

Estimation of Serum Calcium, Phosphorus and Total Protein Profile in Post Partum Crossbred Cows Treated with GnRH-PGF_{2α}

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Abstract The experiment was conducted on 24 post partum crossbred cows at private dairy farm and divided into three treatment (TG) and control (C) groups (6 each) were monitored for serum calcium phosphorus and total protein on 14th, 24th, 27th, 38th, 41st and 42nd of post partum following GnRH and PGF_{2α} and in combination treatment TG-1 (GnRH - PGF_{2α}), TG-2 (GnRH-NS), TG-3 (NS - PGF_{2α}) and control (NS - NS) on day 14th and 24th with fixed timed artificial insemination by injecting PGF_{2α} on day 38th in all the groups (except control) and reveals that mean serum concentration calcium, phosphorus and total protein were 7.91 ± 0.28 (mg/dl), 6.53 ± 0.28 (mg/dl) and 9.28 ± 0.21 (g/dl) in GI; 6.70 ± 0.20 (mg/dl), 6.26 ± 0.21 (mg/dl) and 8.23 ± 0.23 (g/dl) in GII; 6.53 ± 0.15 (mg/dl), 6.89 ± 0.23 (mg/dl) and 9.44 ± 0.19 (g/dl) in GIII; 6.33 ± 0.14 (mg/dl), 7.24 ± 0.24 (mg/dl) and 7.80 ± 0.22 (g/dl) in control group respectively. This implies that calcium and total pro-

tein level did not play significant difference ($p > 0.01$) role in the different groups. Whereas mean phosphorus level was highest in control as compared to treatment groups shows a highly significant difference ($p < 0.01$) indicating significant role in the different groups.

Keywords Artificial insemination, Crossbred cows, GnRH, PGF_{2α}, Post partum.

Introduction

In order for dairy cow to produce the most offspring during her life in a herd she should first at two years of age and again at every 12 months until she is culled. This pattern will also optimize the milk production per day of herd life. Unfortunately this seldom occurs because the interval from calving to subsequent is prolonged. Inadequate nutrition and negative energy balance in post partum cows are the major causes for delayed resumption of ovarian activity, anestrus and sub estrus in dairy animals [1]. This may result in increased calving to conception intervals beyond 60-80 days post partum. Calcium plays an important role in utilization of cholesterol by mitochondria or by stimulating the conversion of pregnenolone to progesterone. GnRH stimulation of LH release from pituitary cells involves a Ca – dependent mechanism. Inorganic phosphorus is important for attainment of sexual maturity, maintenance of regularity of estrus cycle

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Table 1. Serum calcium concentration (mg/dl) (Mean $\pm$ SE) at different time interval in treated and control post partum crossbred animals. Group I : GnRH-PGF_{2 α} ; Group-II : GnRH-NS - Group-III : NS- PGF_{2 α} ; Group IV : Control.

Groups	Days						Overall mean
	14	24	27	38	41	42	
IV (Control)	5.3 $\pm$ 0.11	7.1 $\pm$ 0.38	6.1 $\pm$ 0.26	6.6 $\pm$ 0.35	6.4 $\pm$ 0.23	6.4 $\pm$ 0.29	6.33 $\pm$ 0.14
I	9.4 $\pm$ 0.33	9.9 $\pm$ 0.13	8.6 $\pm$ 0.21	8.0 $\pm$ 0.46	5.8 $\pm$ 0.10	5.6 $\pm$ 0.10	7.91 $\pm$ 0.28
II	6.1 $\pm$ 0.30	8.0 $\pm$ 0.32	8.4 $\pm$ 0.66	6.4 $\pm$ 0.23	5.6 $\pm$ 0.16	5.7 $\pm$ 0.21	6.70 $\pm$ 0.20
III	6.4 $\pm$ 0.21	7.0 $\pm$ 0.26	7.4 $\pm$ 0.50	6.3 $\pm$ 0.31	6.3 $\pm$ 0.19	5.8 $\pm$ 0.15	6.53 $\pm$ 0.15

and often associated with reproductive abnormalities in cattle through infertility. The role of calcium and phospholipids - dependent protein kinase and c-AMP – dependent protein kinase may be crucial in mediating hormone action. Whereas total protein contents are required for estrus expression [2].

Materials and Methods

The experiment was conducted on 24 post partum cross bred cows at Organized Private Dairy Farm located at Jabalpur of 3-5 parity having normal parturition and divided into three treatment (TG) and control (C) groups (6 each) were monitored for serum calcium, phosphorus and total protein on 14th, 24th, 27th, 38th, 41st and 42nd of post partum following GnRH and PGF_{2 α} treatment TG-1 (Gn RH - PGF_{2 α}), TG-2 (GnRH-NS), TG-3 (NS - PGF_{2 α}) and control (NS-NS) on day 14th 250 μ g l/m (Receptal @containing 0.0042 mg/ml of buserelin acetate) and 24th 500 μ g l/m (Juramate ® containing 250 mcg/ml of cloprostenol sodium) with fixed timed artificial insemination by injecting PGF_{2 α} on day 38th 500 μ g l/m in all the groups (except control).

The animals of both the treatment and control groups were followed and compared for their conception rate and serum profile of calcium, phosphorus and total protein on 14, 24, 27, 38, 41 and 42 days of post partum and fixed timed artificial insemination done on 41 and 42 days of post partum and were palpated on 45 days later. The serum samples were stored at -20 °C till assay. The blood biochemical parameters were determined by using standard assay kits (ERBA) and an autoanalyser. The data were analyzed statistically using one way ANOVA and Duncan's multiple range test by Snedecor and Cochran [3].

Results and Discussion

The results of mean serum calcium concentration (mg/dl) on day- 14th, 24th, 27th, 38th, 41st and 42nd of post partum in different treatment groups are presented in Table 1. The serum calcium concentration (mg/dl) are 9.44 $\pm$ 0.33, 9.9 $\pm$ 0.13, 8.6 $\pm$ 0.2, 8.0 $\pm$ 0.46, 5.8 $\pm$ 0.10, 5.6 $\pm$ 0.10 respectively with overall mean 7.91 $\pm$ 0.28 in GI; 6.1 $\pm$ 0.30, 8.0 $\pm$ 0.32, 8.4 $\pm$ 0.66, 6.44 $\pm$ 0.23, 5.6 $\pm$ 0.16, 5.7 $\pm$ 0.21 with overall mean 6.70 $\pm$ 0.20 in GII; 6.4 $\pm$ 0.21, 7.0 $\pm$ 0.26, 7.4 $\pm$ 0.50, 6.3 $\pm$ 0.31, 6.3 $\pm$ 0.19, 5.8 $\pm$ 0.15 with overall mean 6.53 $\pm$ 0.15 in GIII; 5.3 $\pm$ 0.11, 7.1 $\pm$ 0.38, 6.1 $\pm$ 0.26, 6.6 $\pm$ 0.35, 6.4 $\pm$ 0.23, 6.4 $\pm$ 0.29 with overall mean 6.33 $\pm$ 0.14 in control respectively.

The data of mean serum calcium concentration were also compared within and between treatment and control groups (Table 2). However there was no significant difference recorded in serum calcium concentration between the groups separately on different days ($p \geq 0.01$). Sheshappa et al. [4] reported that the level of plasma calcium level in post partum cows treated with GnRH at 14th day of post partum followed by PGF_{2 α} at 26 days. The mean value of plasma calcium in both pre and post treatment samples irrespective of the groups ranged between 8.78 to 9.75 mg per

Table 2. Analysis of variance table regarding serum calcium concentration in different treated and control group in post partum crossbred cows.

Source of variation	Degrees of freedom	Sum of squares	Mean square	F-value
Between group within interval	3	35	18.20	2.72
Between interval within group	20	160	8.02	17.97
Within interval	120	54	0.45	

Table 3. Serum phosphorus concentration (mg/dl) (Mean $\pm$ SE) at different time interval in treated and control post partum crossbred animals.

Groups	Days						Overall mean
	14	24	27	38	41	42	
IV (Control)	8.3 $\pm$ 0.62	8.0 $\pm$ 0.37	7.2 $\pm$ 0.68	6.3 $\pm$ 0.40	7.2 $\pm$ 0.68	6.4 $\pm$ 0.20	7.24 $\pm$ 0.24 ^a
I	7.0 $\pm$ 0.14	6.3 $\pm$ 0.14	7.5 $\pm$ 0.61	9.0 $\pm$ 0.32	4.4 $\pm$ 0.23	4.9 $\pm$ 0.44	6.53 $\pm$ 0.28 ^b
II	5.5 $\pm$ 0.58	7.2 $\pm$ 0.77	7.3 $\pm$ 0.49	5.9 $\pm$ 0.10	5.8 $\pm$ 0.27	5.8 $\pm$ 0.66	6.26 $\pm$ 0.21 ^b
III	7.8 $\pm$ 0.33	7.6 $\pm$ 0.62	8.1 $\pm$ 0.62	6.2 $\pm$ 0.22	6.0 $\pm$ 0.25	5.7 $\pm$ 0.23	6.89 $\pm$ 0.20 ^{ab}

cent. These values are well within the range reported by Malky et al. [5]. Nazar [1] analyzed serum calcium in normal cyclic and suboestrus cross bred cows and found calcium levels non-significantly different (8.40 $\pm$ 0.40 vs 7.83 $\pm$ 0.27 mg percent). Pre and post treatment values were reported as 7.57 $\pm$ 0.59 and 8.01 $\pm$ 0.16 mg percent respectively which revealed non significant difference as well. The average serum calcium level has been found to be 6.80 $\pm$ 0.09 mg/ml and prevalence of deficiency was found 94% in grazing cattle [7]. Patel et al. [8] reported that the recently calved HF cows of university farm were monitored for weekly plasma profile of calcium from the day of calving till 21 weeks post partum following GnRH and PGF_{2 α} treatment at 7th weeks in anestrus and subestrus cows and found that plasma calcium level in subestrus cows were significantly higher as compared to anestrus cows at 7th, 8th, 17th and 21st weeks post partum, including overall mean (8.17 $\pm$ 0.07 vs 7.72 $\pm$ 0.08 mg/dl).

The mean calcium level in the control group was lowest (6.33 $\pm$ 0.14 mg/dl) whereas higher calcium level as compared to control in animals of TG-1 (7.91 $\pm$ 0.28), TG-2 (6.70 $\pm$ 0.20), and TG-3 (6.53 $\pm$ 0.15) although calcium level in all the three treatment groups were higher as compared to control, whereas no significant difference ($p > 0.01$) was observed. This implies that calcium level did not significantly play any role in the animals of different groups. Patel et al. [8] stated that PGF_{2 α} treatment does not have any impact on serum calcium concentration (7.19 $\pm$ 0.94 vs 7.53 $\pm$ 0.86). The results of serum calcium concentration in postpartum crossbred cows are similar to the reports of 8.78 to 9.75 mg/dl [10 x].

The results of mean serum phosphorus concentration (mg/dl) on day- 14th, 24th, 27th, 38th, 41st and 42nd in different treatment groups are presented in Table 3.

The serum phosphorus concentrations (mg/dl) are 7.0 $\pm$ 0.14, 6.3 $\pm$ 0.14, 7.5 $\pm$ 0.61, 9.0 $\pm$ 0.32, 4.4 $\pm$ 0.23, 4.9 $\pm$ 0.44 with overall mean 6.53 $\pm$ 0.28 in G-I; 5.5 $\pm$ 0.58, 7.2 $\pm$ 0.77, 7.3 $\pm$ 0.49, 5.9 $\pm$ 0.10, 5.8 $\pm$ 0.27, 5.8 $\pm$ 0.66 with overall mean 6.26 $\pm$ 0.21 in G-II; 7.8 $\pm$ 0.33, 7.6 $\pm$ 0.62, 8.1 $\pm$ 0.62, 6.2 $\pm$ 0.22, 6.0 $\pm$ 0.25, 5.7 $\pm$ 0.23 with overall mean 6.89 $\pm$ 0.20 in G-III; 8.3 $\pm$ 0.62, 8.0 $\pm$ 0.37, 7.2 $\pm$ 0.68, 6.3 $\pm$ 0.40, 7.2 $\pm$ 0.68, 6.4 $\pm$ 0.20 respectively with overall mean 7.24 $\pm$ 0.24 in control.

The data were analyzed using analysis of variance technique, between and within the treatment and control group (Table 4). Significant difference was observed between and within treatment and control group ($p < 0.01$). The results of serum phosphorus concentration in postpartum crossbred cows are similar to the reports of 5.10 to 6.43 mg/dl [9].

The results of mean serum total protein concentration (g/dl) on day-14th, 24th and 27th, 38th 41st and 42nd in different groups are presented in Table 5. The total protein concentrations (g/dl) were 10.4 $\pm$ 0.46, 10.1 $\pm$ 0.35, 10.1 $\pm$ 0.40, 9.2 $\pm$ 0.38, 7.9 $\pm$ 0.23, 7.9 $\pm$ 0.23, 7.9 $\pm$ 0.18 with overall mean 9.28 $\pm$ 0.21 in G-I; 8.8 $\pm$ 0.35, 10.1 $\pm$ 0.48, 9.4 $\pm$ 0.72, 7.0 $\pm$ 0.22, 7.3 $\pm$ 0.25, 6.8 $\pm$ 0.66 with overall mean 8.23 $\pm$ 0.23 in G-II; 10.2 $\pm$ 0.33, 10.6 $\pm$ 0.41, 9.7 $\pm$ 0.42, 9.3 $\pm$ 0.26, 8.5 $\pm$ 0.09, 8.4 $\pm$ 0.24 with overall mean 9.44 $\pm$ 0.19 in G-III; 8.0 $\pm$ 0.21, 10.1 $\pm$ 0.47,

Table 4. Analysis of variance table regarding serum phosphorus concentration in different treated and control group in post partum crossbred cows.

Source of variation	Degrees of freedom	Sum of squares	Mean square	F-value
Between group within interval	3	19	6.45	0.83**
Between interval within group	20	156	7.81	7.03**
Within interval	130	133	1.11	

Table 5. Serum total protein concentration (g/dl) (mean $\pm$ SE) at different time interval in treated and control post partum crossbred animals.

Groups	14	24	Days 27	38	41	42	Overall mean
IV (Control)	8.0 $\pm$ 0.21	10.1 $\pm$ 0.47	7.2 $\pm$ 0.74	7.3 $\pm$ 0.30	7.0 $\pm$ 0.28	7.1 $\pm$ 0.21	7.80 $\pm$ 0.2
I	10.4 $\pm$ 0.46	10.1 $\pm$ 0.35	10.1 $\pm$ 0.40	9.2 $\pm$ 0.38	7.9 $\pm$ 0.23	7.9 $\pm$ 0.18	9.28 $\pm$ 0.21
II	8.8 $\pm$ 0.35	10.1 $\pm$ 0.48	9.4 $\pm$ 0.72	7.0 $\pm$ 0.22	7.3 $\pm$ 0.25	6.8 $\pm$ 0.66	8.23 $\pm$ 0.23
III	10.2 $\pm$ 0.33	10.6 $\pm$ 0.41	9.7 $\pm$ 0.42	9.3 $\pm$ 0.26	8.5 $\pm$ 0.09	8.4 $\pm$ 0.24	9.4 $\pm$ 0.19

7.2 $\pm$ 0.74, 7.3 $\pm$ 0.30, 7.0 $\pm$ 0.28, 7.1 $\pm$ 0.21 respectively with overall mean 7.80 $\pm$ 0.22 in control. The data were analyzed by analysis of variance technique between and within the treatment and control group (Table 6). This implies that total protein level did not significantly play any role in the animals of different group. Sheshappa et al. [4] reported that the level of total protein level in post partum cows treated with GnRH at 14th day of post partum followed by FGF_{2a} at 26 days. The mean value of plasma total protein level in both pre and post treatment samples irrespective of the groups ranged between 8.68 to 9.13 mg percent. These values are well within the range reported by Singh et al. [9]. Recently calved HF cows were monitored through clinical diagnosis and weekly plasma of total protein from the day of calving till 21st week post partum. It included GnRH (receptal) and PGF_{2a} (lutalyse) treatment at day 48-49 post partum. The mean plasma total protein concentrations did not differ significantly between weeks of even between groups at any of the intervals post partum, including the pooled means (6.51 $\pm$ 0.09 vs 6.64 $\pm$ 0.08 g/dl). The weekly variation in plasma total protein levels of conceived, non- conceived and pooled groups were not significant and so also between the groups, except at calving (6.10 $\pm$ 0.25 vs 6.85 $\pm$ 0.25 g/dl) and at 20th week

post partum (5.32 $\pm$ 0.29 vs 6.51 $\pm$ 0.26 g/dl). Since the range falls within the range reported in literature. The results of serum total protein concentration in post partum crossbred cows are similar to the reports of 8.68 to 9.13 mg/dl [10].

References

1. Nazar M, Bhatt VK, Thakur MS, Baghel RPS, Pandit RK (2004) Effect of Alphos-40 and prostaglandin on induction of oestrus and fertility in sub oestrous crossbred cows. JNKVV Res J 38 : 72—74.
2. Khasatiya CT, Kharadi VB, Dhama AJ, Hinsu TV, Panchal MT, Kavani FS (2005) Effect of GnRH and PGF_{2a} treatment on conception rate and blood biochemical and mineral profile of post partum true anoestrous and suboestrous surti buffaloes. In J Anim Sci 75 : 48—50.
3. Snedecor GW, Cochran WG (1994) Statistical methods. 7th edn. Oxford and IBM Publ Co, New Delhi.
4. Sheshappa H, Honnappagol SS, Dhabale RB, Tandle MK (2002) Efficacy of GnRH and PGF_{2a} in augmenting the reproductive performance of post partum cows. Ind J Anim Reprod 23 : 75—76.
5. Malky EI, Abdel Aziz NA, Salaam AMAEI (2010) Post partum performance of buffaloes treated with GnRH to overcome the impact of placenta retention. J Am Sci 6 : 1680—1695.
6. Nazar M, Bhatt VK, Thakur MS, Baghel RPS, Pandit RK (2004) Effect of Alphos-40 and prostaglandin on induction of oestrus and fertility in sub oestrous crossbred cows. JNKVV Res J 38 : 72—74.
7. Sahoo N, Rout PR, Samal PC, Sardar KK (2007) Macrominerals status in soil, pasture and serum of grazing cattle in orissa. Ind Vet J 85 : 274—276.
8. Patel PM, Dhama AJ, Kavani FS (2011) Plasma calcium and phosphorus and magnesium profile in post partum cows following hormonal therapy. Ind J Anim Reprod 32 : 15—19.
9. Singh RR, Dutt T, Mandal AB, Joshi HC, Pandey HN, Singh M (2009) Effect of body condition score on blood metabolite and production performance in crossbred dairy cattle. Ind J Anim Sci 6 : 242—247.
10. Patel PM, Dhama AJ (2006) Post partum plasma profile of glucose and total protein in Holstein Friesian cows with and without hormone therapy under tropical climate. Ind J Anim Sci 76 : 22—24.

Table 6. Analysis of variance table regarding serum total protein concentration in different treated and control group in post partum crossbred cows.

Source of variation	Degrees of freedom	Sun of squares	Mean square	F- value
Between group within interval	3	69	22.96	2.85
Between interval within group	29	161	8.05	14.33
Within interval	120	67	0.56	