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Effect of Different Ecbolic Therapy on Serum Macro-Micro Minerals Profile in Dystocia Affected Dangi Cows

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Abstract

The study was conducted in eighteen dystocia affected Dangi cows that were handled without any complications from various villages of Dangs district in South Gujarat to evaluate the effect of different ecbolic therapies on serum macro-micro minerals profile. The cows were divided in to three groups consisting six cows in each. Group-I (T1) and II (T2) cows were given methylergometrine (Nexbolic, 5 mg) and dinoprost tromethamine (Lutalyse, 25 mg) i/m, respectively, soon after parturition. The cows in Group-III (T3) received herbal ecbolic (Exapar, 2-4 boluses, b.i.d.) for first 10 days postpartum. The jugular blood samples were collected aseptically on day 0 (day of calving), 7th, 14th 21st and 28th day postpartum to harvest serum. The serum macro-minerals (calcium, inorganic phosphorus, magnesium) and micro-minerals (copper, cobalt, zinc, iron, manganese) were analyzed using commercially available kits. The mean serum calcium level of Dangi cows did not differ significantly ($p>0.05$) between T1, T2 and T3. The serum calcium levels showed increasing trend from day 0 to 28th day postpartum and significantly higher ($p<0.05$) calcium levels were observed on 28th day postpartum. The serum inorganic phosphorus and magnesium levels did not differ significantly ($p>0.05$) at 0 day, 7th, 14th, 21st and 28th day postpartum within and between all the treatment groups including overall mean at different time intervals. The mean copper, cobalt, zinc, iron and manganese concentrations in treatment T1, T2 and T3 groups did not differ significantly ($p>0.05$) at different time intervals among all the treatment groups.

Introduction

Dangi cow (*Bos indicus*) is one of the recognized 38 cattle breeds of India reared mostly by tribes in forest area with undulated hilly track, heavy rainfall and very poor agricultural economy. The breed is important for livelihood of tribal farmers, therefore, the productive potential of Dangi cow needs to be exploited in view to amplify the economic returns to poor class of people and to meet the requirements of researchers. Dystocia causes retention of placenta, endometritis, infertility and subsequent economic losses (Radostits *et al.*, 2000). To increase the productive performance, more emphasis should be given to reproductive health of the herd and priority should be given to postpartum period to reduce inter-calving interval. A dietary deficiency causes metabolic, endocrine and nervous disorders, disturbing the activity of hypothalamic-pituitary-ovarian system, with negative effects on process of breeding, ovogenesis and folliculogenesis, extending postpartum anestrous period and decreasing fertility indices in cows (Ruginosu *et al.,* 2011). As catalytic components of enzymes or to regulate several mechanisms involved in pregnancy and lactation, cows require minerals like calcium, phosphorus and magnesium for growth, reproduction and lactation (Tanritanir *et al.,* 2009). Lack of trace elements such as copper, cobalt, zinc, iron, manganese etc. upset the proper functioning of genital organs (Parmar *et al.,* 2015). Hence, the present study was aimed to evaluate the effect of different ecbolic treatments at calving on serum macro-micro mineral constituents during postpartum period in dystocia affected Dangi cows.

Materials and Methods

The present study was carried out on 18 dystocia affected Dangi cows under field that were handled with obstetrical aids without any complications. The study covered period from parturition to puerperal period and thereafter up to eighteen months postpartum maintained at farmer's doorstep in different villages of Dangs district, Gujarat, India. They were randomly divided into three groups comprising six cows in each. The cows in Group-I (T1) and II (T2) were treated intramuscularly with Methylergometrine maleate (inj. Nexbolic, 5 mg, Intas Pharmaceuticals Ltd.) and Dinoprost tromethamine, a natural $PGF_2\alpha$ (inj. Lutalyse, 25 mg, Pfizer Animal Health Ltd.), respectively, immediately after parturition. The cows in Group-III (T3) were treated with herbal ecbolic (bol. Exapar, 2-4 bolus bid, Ayurvet Limited) for first 10 days postpartum.

Jugular blood samples were collected from all animals on day of parturition (0 day), on 7^{th}, 14^{th}, 21^{st} and 28^{th} day postpartum in vaccutainers and serum was separated after clotting and centrifugation at 3000 rpm for 15 minutes and stored at -20°C in deep freezer until estimation of serum macro-minerals (calcium, inorganic phosphorus, magnesium) and micro-minerals (copper, cobalt, zinc iron, manganese). The biochemical analysis was performed using commercially available kits (Diatek Healthcare Pvt. Ltd., Hooghly, India).

The data on macro-micro mineral profiles were suitably tabulated and analyzed following standard statistical methods using CRD and DMRT as per Steel and Torrie (1981).

Results and Discussion

Macro-minerals Profile

The mean serum calcium, inorganic phosphorus and magnesium concentrations at different time intervals in treated Dangi cows are presented in Table 1.

The present finding of overall mean serum calcium concentration (10.74 ± 0.16 mg/dl) was in agreement with values reported by Joe Arosh *et al*. (1998) in cyclic cows and by Sharma *et al*. (1998) in Jersey crossbred cows. The overall mean serum calcium level of Dangi cows did not differ significantly ($p>0.05$) between T1, T2 and T3 groups. Moreover, the calcium level in T1 did not differ significantly ($p>0.05$) between early postpartum periods, but differed significantly ($p<0.01$) at 28^{th} day postpartum. The trend of serum calcium concentration observed in present study was supported by Devraj (1982) in non-suckled Surti buffaloes starting from two hours till 38^{th} day postpartum. The mean serum calcium levels were found within the normal physiological range in cows (9.72 to 12.4 mg/dl) as stated by Radostits *et al.* (2000).

The mean serum inorganic phosphorus level of Dangi cows did not differ significantly ($p>0.05$) between postpartum periods within and between groups including overall means at different time intervals. The overall pooled mean serum inorganic phosphorus level (7.43±0.12 mg/dl) was in agreement with values reported by Sarkar *et al*. (2015) in lactating and non-lactating crossbred cows, respectively. However, lower and higher phosphorus levels were also reported by Khasatiya *et al.* (2005) in Surti buffaloes and Yokus *et al*. (2010) in cows. In inorganic phosphorus deficiency, fertility of the cows is reduced leading to delayed conception, while increased blood phosphorus level was related to the improvement of ovarian activity (Upadhyay *et al.,* 2006).

The mean serum magnesium level did not differ significantly ($p>0.05$) among different postpartum periods within any of the groups.

Table 1: Serum macro-micro minerals profile of ecbolic treated Dangi cows at different time intervals (Mean ± SEM)

Groups/ Parameter	Time Intervals/Days					Overall	F-Value	P-Value
	0 day (Day of Calving)	7th Day postpartum	14th Day postpartum	21st Day postpartum	28th Day postpartum			
Macro-minerals Profile (mg/dl)								
Calcium (mg/dl)								
Group-I	09.89±0.41$^{a}_{w}$	09.87±0.45$^{a}_{w}$	10.43±0.39$^{a}_{w}$	10.94±0.27$^{a}_{w}$	12.43±0.57$^{b}_{w}$	10.71±0.25$_{w}$	5.897**	0.002
Group-II	09.83±0.48$^{a}_{w}$	09.95±0.50$^{a}_{w}$	10.61±0.56$^{a}_{w}$	11.21±0.60$^{ab}_{w}$	12.29±0.48$^{b}_{w}$	10.78±0.27$_{w}$	3.621*	0.018
Group-III	09.73±0.65$^{a}_{w}$	10.15±0.78$^{a}_{w}$	10.14±0.67$^{a}_{w}$	10.92±0.63$^{ab}_{w}$	12.70±0.61$^{b}_{w}$	10.73±0.34$_{w}$	3.063*	0.035
Overall	09.82±0.28^{a}	09.99±0.32^{a}	10.39±0.30^{ab}	11.02±0.29^{b}	12.47±0.30^{c}	10.74±0.16	12.510**	0
Inorganic Phosphorus (mg/dl)								
Group-I	7.80±0.37$^{a}_{w}$	7.70±0.51$^{a}_{w}$	7.78±0.62$^{a}_{w}$	7.55±0.83$^{a}_{w}$	7.19±0.48$^{a}_{w}$	7.60±0.24$_{w}$	0.185	0.944
Group-II	7.50±0.54$^{a}_{w}$	7.63±0.30$^{a}_{w}$	7.29±0.41$^{a}_{w}$	7.14±0.39$^{a}_{w}$	7.06±0.48$^{a}_{w}$	7.32±0.18$_{w}$	0.303	0.873
Group-III	7.67±0.53$^{a}_{w}$	7.45±0.40$^{a}_{w}$	7.34±0.57$^{a}_{w}$	7.22±0.56$^{a}_{w}$	7.20±0.56$^{a}_{w}$	7.38±0.22$_{w}$	0.132	0.969
Overall	7.65±0.26^{a}	7.59±0.22^{a}	7.47±0.29^{a}	7.30±0.34^{a}	7.15±0.27^{a}	7.43±0.12	0.537	0.709
Magnesium (mg/dl)								
Group-I	3.00±0.19$^{a}_{w}$	3.12±0.35$^{a}_{w}$	3.67±0.62$^{a}_{w}$	3.74±0.40$^{a}_{w}$	3.98±0.40$^{a}_{w}$	3.50±0.18$_{x}$	1.002	0.425
Group-II	2.79±0.25$^{a}_{w}$	3.28±0.28$^{a}_{w}$	3.71±0.64$^{a}_{w}$	3.05±0.38$^{a}_{w}$	3.30±0.46$^{a}_{w}$	3.23±0.18$_{x}$	0.635	0.642
Group-III	2.39±0.26$^{a}_{w}$	2.73±0.47$^{a}_{w}$	2.57±0.27$^{a}_{w}$	2.77±0.46$^{a}_{w}$	3.02±0.58$^{a}_{w}$	2.70±0.18$_{w}$	0.291	0.881
Overall	2.73±0.14^{a}	3.04±0.21^{a}	3.32±0.31^{a}	3.18±0.24^{a}	3.43±0.28^{a}	3.14±0.11	1.198	0.317
Micro-minerals Profile (µg/ml)								
Copper (µg/ml)								
Group-I	0.742±0.024$^{a}_{w}$	0.742±0.028$^{a}_{w}$	0.750±0.024$^{a}_{w}$	0.738±0.031$^{a}_{w}$	0.728±0.026$^{a}_{w}$	0.740±0.011$_{w}$	0.09	0.985
Group-II	0.769±0.044$^{a}_{w}$	0.764±0.034$^{a}_{w}$	0.771±0.023$^{a}_{w}$	0.746±0.036$^{a}_{w}$	0.741±0.036$^{a}_{w}$	0.758±0.015$_{w}$	0.148	0.962
Group-III	0.730±0.038$^{a}_{w}$	0.723±0.028$^{a}_{w}$	0.746±0.019$^{a}_{w}$	0.734±0.012$^{a}_{w}$	0.733±0.019$^{a}_{w}$	0.733±0.010$_{w}$	0.112	0.977
Overall	0.747±0.020^{a}	0.743±0.017^{a}	0.756±0.012^{a}	0.739±0.015^{a}	0.734±0.015$^{a}_{w}$	0.744±0.007	0.251	0.908
Cobalt (µg/ml)								
Group-I	0.599±0.140$^{a}_{w}$	0.625±0.125$^{a}_{w}$	0.652±0.110$^{a}_{w}$	0.683±0.147$^{a}_{w}$	0.685±0.144$^{a}_{w}$	0.649±0.056$_{w}$	0.077	0.989
Group-II	0.606±0.146$^{a}_{w}$	0.590±0.138$^{a}_{w}$	0.636±0.147$^{a}_{w}$	0.672±0.141$^{a}_{w}$	0.672±0.111$^{a}_{w}$	0.635±0.057$_{w}$	0.074	0.989
Group-III	0.587±0.063$^{a}_{w}$	0.587±0.074$^{a}_{w}$	0.642±0.091$^{a}_{w}$	0.672±0.091$^{a}_{w}$	0.692±0.075$^{a}_{w}$	0.636±0.034$_{w}$	0.362	0.833
Overall	0.597±0.066$_{w}$	0.601±0.063$_{w}$	0.644±0.064$_{w}$	0.676±0.070$_{w}$	0.683±0.061$_{w}$	0.640±0.028	0.382	0.821
Zinc (µg/ml)								
Group-I	0.773±0.162$^{a}_{w}$	0.770±0.144$^{a}_{w}$	0.783±0.180$^{a}_{w}$	0.792±0.129$^{a}_{w}$	0.796±0.120$^{a}_{w}$	0.783±0.061$_{w}$	0.006	1
Group-II	0.800±0.124$^{a}_{w}$	0.786±0.115$^{a}_{w}$	0.778±0.141$^{a}_{w}$	0.784±0.113$^{a}_{w}$	0.781±0.120$^{a}_{w}$	0.786±0.051$_{w}$	0.005	1
Group-III	0.761±0.139$^{a}_{w}$	0.773±0.141$^{a}_{w}$	0.767±0.153$^{a}_{w}$	0.787±0.154$^{a}_{w}$	0.768±0.138$^{a}_{w}$	0.771±0.060$_{w}$	0.004	1
Overall	0.778±0.077$_{w}$	0.776±0.072$_{w}$	0.776±0.086$_{w}$	0.787±0.072$_{w}$	0.782±0.068$_{w}$	0.780±0.033	0.004	1
Iron (µg/ml)								
Group-I	1.116±0.098$^{a}_{w}$	1.225±0.127$^{a}_{w}$	1.202±0.119$^{a}_{w}$	1.158±0.097$^{a}_{w}$	1.126±0.119$^{a}_{w}$	1.165±0.047$_{w}$	0.174	0.95
Group-II	1.118±0.109$^{a}_{w}$	1.237±0.128$^{a}_{w}$	1.254±0.162$^{a}_{w}$	1.163±0.120$^{a}_{w}$	1.112±0.133$^{a}_{w}$	1.177±0.055$_{w}$	0.25	0.907
Group-III	1.095±0.129$^{a}_{w}$	1.215±0.153$^{a}_{w}$	1.211±0.107$^{a}_{w}$	1.144±0.126$^{a}_{w}$	1.100±0.155$^{a}_{w}$	1.153±0.057$_{w}$	0.184	0.945
Overall	1.110±0.061^{a}	1.226±0.074^{a}	1.222±0.071^{a}	1.155±0.062^{a}	1.113±0.074^{a}	1.165±0.030	0.673	0.612
Manganese (µg/ml)								
Group-I	0.767±0.099$^{a}_{w}$	0.718±0.094$^{a}_{w}$	0.739±0.088$^{a}_{w}$	0.749±0.089$^{a}_{w}$	0.765±0.086$^{a}_{w}$	0.748±0.038$_{w}$	0.048	0.995
Group-II	0.766±0.099$^{a}_{w}$	0.723±0.112$^{a}_{w}$	0.722±0.093$^{a}_{w}$	0.752±0.100$^{a}_{w}$	0.753±0.107$^{a}_{w}$	0.743±0.042$_{w}$	0.037	0.997
Group-III	0.755±0.086$^{a}_{w}$	0.701±0.077$^{a}_{w}$	0.738±0.073$^{a}_{w}$	0.742±0.053$^{a}_{w}$	0.750±0.061$^{a}_{w}$	0.737±0.029$_{w}$	0.087	0.986
Overall	0.762±0.051$_{w}$	0.714±0.052$_{w}$	0.733±0.046$_{w}$	0.748±0.045$_{w}$	0.756±0.047$_{w}$	0.743±0.021	0.158	0.959

Means bearing different superscripts within the column (w,x) or within the row (a,b,c) for a trait differ significantly ($p<0.05$).

However, it differed significantly ($p<0.05$) between T1 and T3 as well as between T2 and T3. The overall mean serum magnesium level (3.14±0.11 mg/dl) was in agreement with values reported by Hagawane *et al*. (2009) in cows during early, mid and late lactation. Whereas, slightly higher magnesium levels were reported by Patel *et al*. (2017) in Methylergometrine, $PGF_2\alpha$ and Utrovet treated HF crossbred cows, while lower mean magnesium level as 2.15±0.05 mg/dl was documented by Regmi and Pande (2017) in lactating crossbred Jersey cattle. The differences reported in mean serum calcium, phosphorus and magnesium concentrations by various workers could be attributed to variation in breed, species, parity, lactation and nutritional status in addition to analytical differences.

Macro-minerals Profile

The mean serum copper, cobalt, zinc, iron and manganese levels did not differ significantly (p>0.05) within and between groups including overall means at different time intervals (Table 1).

The overall serum copper concentration (0.744±0.007 μg/ml) was in agreement with reports of Chauhan *et al.* (1992) in puerperal cows and of Chauhan and Nderingo (1997) during cycling and late postpartum cows. However, higher levels as 0.98±0.07 μg/ml was reported by Desai *et al.* (1979) in Dangi cows and by Patel *et al.* (2017) in Methylergometrine, $PGF_2\alpha$ and Utrovet treated HF crossbred cows. The overall serum cobalt concentration (0.640±0.028 μg/ml) was comparable with report of Djokovic *et al.* (2014) in Simmental cows. However, cobalt deficiency has been associated with non-functional ovaries and general infertility as it is important in the synthesis of Vitamin B_{12}.

The overall serum zinc concentration (0.780±0.033 μg/ml) was in agreement with the report of Singh *et al.* (1991) in buffaloes during postpartum period. The non-significant increase in mean serum zinc levels observed post-parturient cows was also in line with report of Rajora and Pachauri (1994). The overall serum iron concentration (1.165±0.030 μg/ml) obtained was in agreement with value eported by Jacob *et al.* (2003) in crossbred cows during early lactation in first month and by Karimi *et al.* (2015) during one and three weeks after calving in dairy cows. The present findings of non-significant variations between postpartum periods were in agreement with Mehere *et al.* (2002) in crossbred cows. The overall mean serum manganese concentration (0.743±0.021 μg/ml) was in agreement with report of Shahjalal *et al.* (2008), who found non-significant differences in circulatory levels of manganese in non-pregnant buffalo heifers.

The higher or lower values in various trace elements reported by various workers as compared to present findings might be attributed to either difference in breed, species, age and parity or variation in nutrition, reproductive and health status of animals, apart from seasonal and analytical differences.

Conclusion

Non-significant differences in serum macro and micro-minerals between various ecbolic treated groups at different time intervals correlated well with better micronutrient status of Dangi cows maintained entirely on grazing in the dense forest area enriched with wide range of biodiversity in the Dangs district of Gujarat state. The microelements cannot be synthesized in the body. Hence, it is concluded that trace elements should be supplied daily in the field and in organized farms in the form of mineral mixture to suffice the requirement of the trace elements to avoid imbalance leading to inactive ovaries with decreased progesterone production by corpus luteum and subsequent infertility.

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Conflict of Interest:

All authors declare that they do not have conflict of interest.

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