Serum Macro-Micro Minerals Profile in Dystocia Affected Dangi Cows Treated With Different Ecbolic Agents

D. B. Bhoi¹, C. T. Khasatiya¹ and J. B. Dobariya²

Krishi Vigyan Kendra
Navsari Agricultural University (NAU) Waghai - 394730 (Gujarat)
*Corresponding author: E-mail: drdhirenvet@gmail.com

ABSTRACT
The study was conducted in eighteen dystocia affected Dangi cows that delivered with artificial aids 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, immediately after parturition. The cows in Group-III (T3) received herbal ecbolic (Exapar, 2-4 boluses, b.i.d.) on the day after parturition till 10 days. The jugular vein punctured blood samples were aseptically collected on day 0 (day of calving), 7th, 14th, 21st, and 28th day postpartum to harvest serum and 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 with overall calcium level found to be 10.74 ± 0.16 mg/dl from all the treatment groups. The serum calcium levels were found increased 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 with overall pooled levels to be 7.43 ± 0.12 mg/dl and 3.14 ± 0.11 mg/dl, respectively. 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.

KEYWORDS: macro-micro minerals, ecbolic, Dangi cow, postpartum, dystocia

Received 12.07.2018 Revised 20.08.2018 Accepted 10.09.2018

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 found in Dangs district and adjoining areas of Navsari and Tapi districts in Gujarat and Nashik, Ahmednagar and Dhule districts in Maharashtra. 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 [20]. 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 [9]. The puerperal period is a critical phase in the reproductive cycle of dairy cows which includes reduction of uterine size, regeneration of the endometrium, elimination of bacterial contamination and resumption of ovarian cyclicity [28]. 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 [23]. 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 [31]. Trace elements may function as co-factors, as activators of enzymes or stabilizers of secondary molecular structure. Lack of trace elements such as copper, cobalt, zinc, iron, manganese etc. upset the proper functioning of genital organs [18]. 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.

MATERIAL AND METHODS
Experimental Animals and Blood Collection Schedule
The present study was carried out on 18 dystocia affected Dangi cows followed by successful parturition
with artificial aids without any complications, 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 PGF2α (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 b.i.d, Ayurvet Limited, P.O.-Baddi-173 205, Distt. Solan,
H.P., India) after calving till 10 days.

Jugular vein punctured blood samples were collected from all animals on day of parturition (0 day), on
7th, 14th, 21st and 28th day postpartum in vaccutainers (serum clotting vaccutainers, BD vaccutainers) and
serum was separated after clotting and centrifugation at 3000 rpm for 15 minutes and stored at -20°C in
deep freezer until analysis for 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, WB, India).

Statistical Analysis
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 [30].

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 findings on overall mean serum calcium concentration as 10.74 ± 0.16 mg/dl was in
agreement with 10.69 ± 2.05 mg/dl and 10.71 ± 0.36 mg/dl reported by Sharma et al. [27] and Joe Arosh
et al. [12], respectively in cyclic cows and 10.77 ± 0.37 mg/dl reported 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 0 day (day of calving), 7th, 14th and 21st day postpartum but differ significantly (p<0.01) at 28th
day postpartum. The trend of serum calcium concentration observed in present study was supported by
Devraj (1982), who also reported that serum calcium levels in postpartum non-
suckled Surti buffaloes fluctuated at very narrow range starting from two hours till 38th day postpartum. The mean serum
calcium levels were found within the normal physiological range in cows reported as 9.72 to 12.4 mg/dl
by Radostits et al. (2000) and 8.4 to 11.2 mg/dl by Merck (2003), respectively.

The mean serum inorganic phosphorus level of Dangi cows did not differ significantly (p>0.05) at 0 day
(day of parturition), 7th day, 14th day, 21st day and 28th day postpartum within and between all the
treatment groups including overall mean between & within the groups at different time intervals. The
overall mean serum inorganic phosphorus level from all the groups was 7.43 ± 0.12 mg/dl reported by Gopinath
et al. [7] and Sarker et al. [24] in lactating crossbred cows and non-lactating HF × local crossbred dairy cows, respectively. Though, it was
within the normal range reported as 4.33 to 7.74 mg/dl by Merck (17). However, lower and higher
phosphorus levels were also reported as 6.23 ± 0.19 mg/dl and 7.95 ± 1.36 mg/dl by Khasatiya et al. [15]
and Yokus et al. [33] in Surti buffaloes and in postpartum cows, respectively. In inorganic phosphorus
deficiency, fertility of the cows reduced leading to delayed conception, while increased blood phosphorus
level was related to the improvement of ovarian activity [32].
Means bearing different superscripts within the column (w,x) or within the row (a,b,c) for a trait differ significantly (p<0.05).

The mean serum magnesium level did not differ significantly (p>0.05) at 0 day (day of parturition), 7th day, 14th day, 21st day and 28th day postpartum within all the treatment groups. However, it differed significantly (p<0.05) between T1 and T3 as well as between T2 and T3. The overall mean serum magnesium level as 3.14 ± 0.11 mg/dl was in agreement with 3.02 ± 0.36 and 3.20 ± 0.96 mg/dl reported by Hagawane et al. [8] in cows during early, mid and late lactation, respectively. Whereas, higher magnesium levels reported as 3.27 ± 0.07, 3.35 ± 0.07 and 3.36 ± 0.06 mg/dl by Patel et al. [9] in Methylergometrine, PGF2α and Utrovet treated HF crossbred cows, respectively and lower magnesium concentrations as 2.15 ± 0.05 mg/dl by Regmi and Pande [22] in lactating crossbred Jersey cattle. Finally, the various differences reported in mean serum calcium, inorganic phosphorus and magnesium concentrations by various research workers could be attributed to variation in breed, species, parity, lactational 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 all the treatment groups including overall mean at different time intervals (Table 1). The overall serum copper concentration as 0.74 ± 0.007 µg/ml was in agreement with 0.64 to 0.75 µg/ml reported by Chauhan et al. [3] in puerperal cows and 0.72 ± 0.06 µg/ml and 0.75 ± 0.07 µg/ml reported by Chauhan and Nderingo [2] during cycling and late postpartum cows, respectively. However,
higher levels as $0.98 \pm 0.07 \, \mu g/ml$ reported by Desai et al. [4] in Dangi cows and $0.997 \pm 0.033, 1.018 \pm 0.030$ and $1.018 \pm 0.033 \, \mu g/ml$ reported by Patel et al. [19] in Methylergometrine, PGF$_{2\alpha}$ and Utrovet treated groups in HF crossbred cows, respectively. The present findings were also in agreement with Bostedt et al. [1], who reported serum copper concentrations remained almost constant during pregnancy and puerperal period in cows. The overall serum cobalt concentration as $0.640 \pm 0.028 \, \mu g/ml$ was comparable with $0.63 \pm 0.09$ reported by Djokovic et al. [6] in Simmental cows and $0.64 \pm 0.02 \, \mu g/ml$ reported by Khasatiya [14] in postpartum Surti buffaloes treated with PGF$_{2\alpha}$. The non-significant variation in mean serum cobalt concentration was in agreement with Khasatiya [14] in suboestrus postpartum Surti buffaloes. 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 as $0.780 \pm 0.033 \, \mu g/ml$ was in agreement with $0.765 \pm 0.04 \, \mu g/ml$ reported by Singh et al. [29] in buffaloes during postpartum period. The mean serum zinc levels observed non-significantly increased in post-parturient cow reported by Rajora and Pachauri [21], such trend was also found in present study.

The overall serum iron concentration as $1.165 \pm 0.030 \, \mu g/ml$ was in agreement with $1.13 \pm 0.09$ ppm reported by Jacob et al. [10] in crossbred cows during early lactation in first month and $122.93 \pm 26.18$ and $125.68 \pm 26.51 \, \mu g/dl$ reported by Karimi et al. [13] during one week and three week after calving in dairy cows, respectively. The present findings were in agreement with Mehere et al. [16], who reported iron levels did not show significant variation in weekly time intervals from one month prepartum to one month postpartum in crossbred cows.

The overall mean serum manganese concentration as $0.743 \pm 0.021 \, \mu g/ml$ was in agreement with $0.71 \pm 0.19$ ppm reported by Shahjalal et al. [25] in cattle. The present findings were in agreement with Jain and Madan [11], 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 research 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 which can be correlated well with better micronutrient status of Dangi cows especially maintained on entire grazing in the dense forest area enriched with wide range of biodiversity in the Dangs district of Gujarat state. The trace elements cannot be synthesized in the body. Hence, it is concluded that trace elements should be daily supplied in the field and in organized farms in the form of mineral mixture to suffice the requirement of the trace elements. It had been found that dairy animals are frequently affected with varying degree of trace element deficiencies, especially Cu, Co, Zn, Fe and Mn in various regions of the world and the imbalances leads to inactive ovaries with decreased progesterone production by corpus luteum and subsequent infertility.

ACKNOWLEDGEMENT
Authors are highly thankful to Dean and Principal, Veterinary College, NAU, Navsari for financial support and Head, Department of Veterinary Physiology and Biochemistry and Department of Animal Nutrition for providing valuable research facilities during present study.

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