SEASONAL EFFECT ON BLOOD BIOCHEMICAL PARAMETERS IN KANKREJ CATTLE AT DIFFERENT LEVEL OF THEIR PRODUCTIVITY

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Received 22-12-13 Accepted 17-2-2014

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ABSTRACT

The present study was carried out to evaluate the effect of seasons on vital biochemical parameters of Kankrej cattle at different level of their milk yielding ability. Blood samples were collected in all three seasons of the year viz. winter, summer and monsoon from the three experimental groups i.e. group-I (low yielder), group II (medium yielder) and group III (high yielder). There was non-significant variation in glucose level amongst the groups except it was significantly higher in group III during monsoon. Similarly, significantly higher values of total protein were recorded in group III and group II during summer. Conversely, BUN level did not vary significantly amongst the groups throughout the year. However, there was non-significant but progressive increase in calcium level from winter to monsoon. The seasonal trend in phosphorus level was fairly definite and variations between seasons and groups were significant. The magnesium level decreased non-significantly from monsoon to summer.

KEYWORDS: Kankrej, Season, Milk yield, Biochemical, Lactation

INTRODUCTION

Blood biochemistry is of utmost importance for differential diagnosis of clinical conditions as well as to assess metabolic health of animals. The blood biochemical parameters are affected by many factors including sex, age, reproductive status and seasonal variations (Cetin et al., 2009). As of now, there is no information on the effect of different seasons of the year on biochemical profile of Kankrej cattle, a native breed of Gujarat, India. Considering that environmental conditions are physiological stressors, which affect animal's biological system, the study was undertaken to investigate the seasonal variation of blood biochemical parameters of Kankrej cattle at different levels of their milk yielding ability.

MATERIALS AND METHODS

The study was conducted in the Banaskantha district of North Gujarat. The region falls under semi-arid agro-climatic zone with harsh climatic conditions for livestock entrepreneurship. In the present study, eighteen (18) clinically healthy Kankrej cows reared at Livestock Research Station (LRS), SDAU, Sardarkrushinagar were selected and were categorized based on their milk yield record into three groups of six animals each viz. group-I (low yielder), Group II (medium yielder) and Group III (high yielder).

Blood samples were collected aseptically in collection tubes containing anticoagulant viz. Lithium heparin once from each animal of all three groups via jugular vein puncture during different seasons of the year i.e. winter (November to February), summer (March to June) and monsoon (July to September). The collected samples were used for estimation of some biochemical constituents, glucose (Glu), total protein (TP), albumin (Alb), Blood Urea Nitrogen (BUN), Calcium (Ca), Phosphorus (P) and magnesium (Mg) by employing ready to use kit (Ecoline, Merck Specialities Private Ltd., India) in Chemistry Analyser-364 (Systronics India Ltd, India).

All the results were expressed as mean ± standard deviation (SD) and were statistically analyzed using two-way ANOVA as per the method of Snedecor and Cochran (1994). $p < 0.05$ was considered to be statistically significant.

RESULTS AND DISCUSSION:

The mean ± standard error values recorded for the different biochemical parameters studied in this experiment are presented in Table.

Blood glucose concentration indicates energy status of dairy animals. The glucose level recorded in the present study did not vary significantly among different experimental groups except that it was significantly higher in high yielding group during monsoon season. Similar types of observations were also reported by Mapiye et al. (2010). The higher level of glucose observed during monsoon may be attributed to the availability of green grass during this season with relatively high palatability and nutritive value (Evitayani et al., 2004). On the contrary, lowest value of blood glucose was recorded during summer season in all the groups. The decrease in the glucose concentration during the summer could be due to the reduction in feed intake as a result of thermal stress with simultaneous increase in water consumption and probably due to depletion of hepatic glycogen (Mohamed et al., 2012). Otherwise, the mean values of glucose obtained for the animals of the different groups during the current investigation were within the physiological range.

Total protein content is usually used as an indicator of animals' nutritive status reflecting food intake and metabolism (Serdaru et al., 2011). Present study revealed that the total protein concentrations recorded during summer in group III and group II were significantly higher than those of other two seasons. Whereas, in group-I, the total protein concentration recorded in the summer season varied significantly only from that of monsoon. Shrikhande et al. (2008) also reported higher value of total serum protein in lactating cows during summer. The albumin values obtained in our study was also recorded to be peak during summer season. This finding is in agreement with the reports of Al-Eissa and Alkahtani (2011). Conversely, Cozzi et al. (2011) observed that although total protein level increases during summer, the albumin fraction is unaffected by season. Fischbach et al. (2004) explained that since the ambient temperature is higher with low relative humidity during summer, the animals suffer from severe dehydration, which leads to elevation of total protein and albumin concentration in blood. This hypothesis was also subsequently supported by Braun et al. (2010).

In the present study, BUN level did not vary significantly ($p>0.05$) among the experimental groups during all the seasons of the year. However, an apparently higher value of BUN was recorded in the summer season as compared to other two seasons. Our results corroborate the previous reports (Shrikhande et al., 2008; Al-Eissa and Alkahtani, 2011). Earlier studies indicated that BUN/or milk urea nitrogen (MUN) could be indicator of nutritional status and nitrogen utilization efficiency in lactating dairy cattle, since it rapidly changes with variation in diet protein content (Serdaru et al., 2011). The apparent summer hike of BUN is due to heat stress that cause increased catabolism of amino acid for energy (Abeni et al., 2007). Some of these amino acids could be derived from the protein mobilization of muscle tissue, which also support increase in the level of BUN observed during summer season.

As regards the mineral profile, we studied seasonal variation of three major elements viz. calcium, phosphorus and magnesium. However, no significant differences were observed in calcium level between the groups. Nonetheless, there was a apparent increase in the blood calcium level from winter season to monsoon. The finding that season did not affect Ca concentrations significantly is consistent with earlier report of Mapiye et al. (2010).

Conversely, the seasonal trend observed in blood phosphorus level was fairly definite and variations between seasons as well as the production groups were significant. Highest blood phosphorus levels were found in monsoon followed by summer. In fact, there is no specific homeostatic mechanism for regulating blood phosphorus. Phosphorus is usually mobilised from bone in response to calcium homeostatic mechanisms. A liberal supply of calcium and phosphorus is essential for lactation (Wu et al., 2000). The lower level of phosphorus observed in the low yielding group of cows in all the three seasons during the present study justify this statement.

Current study further revealed that there is a non-significantly decreasing trend of Mg level from monsoon to summer. However, Mapiye et al. (2010) reported that Mg concentrations were significantly influenced by season; the hot-wet season had the lowest concentration of Mg compared to other season. The observation that Mg was lower in summer season as compared to other seasons is likely to be a consequence of low dietary intake. It is reported that the grasses in the early vegetative stages in the early to mid hot-wet season usually have low magnesium content (Poppi and McLennan, 1995). Reduced Mg utilization by ruminants during the hot-wet season has also been related to low carbohydrate and high nitrogen intake (National Research Council, 2001).Further, previous reports demonstrated that high rumen ammonia concentrations usually observed during the hot-wet season also interfere with absorption and/or utilization of Mg (Miller et al., 1980). Serum Mg concentrations reflect daily intake rather than reserves, which are not quickly available (Whitaker et al., 1999).

The present study provide reference values of major blood biochemical analytes for use in future research and to assess their adaptation to environmental changes, together with the effect of lactation on metabolism of lactating cows in terms of their productivity.

ACKNOWLEDGEMENTS

The authors are grateful to Research Scientist, Livestock Research Station and Dean, College of Veterinary Science and A.H., SDAU, Sardarkrushinagar for providing necessary support to carry out the research work.

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