

## Seasonal investigation of serum magnesium concentration in native cattle at Western Azerbaijan Province, Iran

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**ABSTRACT :** Ruminants are very sensitive to serum magnesium concentration, because haven't sufficient reserve of this macro element in the body. The scientific reports showed that serum magnesium concentration can be different by season and breed of cattle. Many of studies in this area were done on pure breeds and little information was available for native populations of cattle. This study was conducted to investigation of serum magnesium concentration in Iranian native cattle in different seasons. In this study, the blood samples collected from 400 head native cattle (in Western Azerbaijan province) in different seasons were analyzed for serum magnesium concentration by colorimetric method. Results showed 1.24, 1.27, 1.53 and 1.47 mg/dl Mg levels for spring, summer, autumn and winter respectively, in total. Highest and lowest Mg concentration was observed in males at autumn by 1.59 mg/dl and females at spring by 1.24 mg/dl Mg, respectively. Totally, the Mg level was higher in males in compared with females. Almost, Observed serum Mg levels of native cattle were in standard ranges that reported in previous studies. In the spring and summer, the main feed for cattle is green forage, especially grasses. It is suggested that, Because of rainy climate of region in this seasons, soil hasn't sufficient Mg reserve for grasses, and animals that grazed on pasture with low Mg concentration couldn't received sufficient Mg. in other hand, in these seasons high milk yield of cattle can excrete significant concentration of Mg via milk production. In conclusion, the serum magnesium concentration of Iranian native cattle at western Azerbaijan province in different seasons is not significantly lower than reported optimum ranges. It seems that, the observed insignificant decline of Mg concentration in spring and summer hasn't risk of any diseases caused by hypomagnesaemia.

**Key words:** magnesium, hypomagnesaemia, native cattle, Iran

### INTRODUCTION

Magnesium is one of essential electrolytes that must be in sufficient concentration in serum of ruminants. Ruminants are sensitive to dietary magnesium, because of lack of considerable magnesium reserve in the body tissues naturally, also the balance of magnesium concentration of extra-cellular fluids is depend on dietary Mg levels (Underwood and Suttle, 1999). Hypomagnesaemia in cattle is the main reason of subsequent grass tetanus that may lead to considerable economic losses in dairy farms (Hurley et al., 1990). Numbers of disorders raised from hypomagnesaemia are more than hypermagnesaemia relative disorders (Radostis et al., 2000). In the previous studies reported that in the winter high incidence of hypomagnesaemia observed in cattle, commonly, in other word, in the winter cattle are susceptible for this disorder (Vajda, 1997; Radostits et al., 2000). Animal and ration factors are affecting Mg metabolism in the body. Although, mg content of pasture forages are different, seasonal variation of mg content of a pasture grass is little (Minson, 1990) but studies indicate seasonal variation of mg concentration in dairy cattle (Wideus et al. 1992; Radostits et al., 2000; Ramin et al., 2005). Some of reports observed the mg level of serum is variable in different breeds. For example, *Aberdeen Angus* cattle have less serum mg concentration in compared with other breeds (Littledike et al., 1995). In other hand, winter grasslands commonly are poor mg source and grazed cattle had lower mg intake and lower mg concentration and high incidence of hypomagnesaemia (Radostits et al., 2000).

In Azerbaijan provinces of Iran, winter grasslands are poor. So, rearing system is based on intensive farming in this season and feeding is based on hays, grains and concentrate feeds. Because

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of seasonal and genetically variation of mg levels in cattle and lack of information about mg concentration in native cattle population in Iran, aim of this study was to Seasonal investigation of serum magnesium concentration in native cattle at Khoy region (western Azerbaijan province)- Iran.

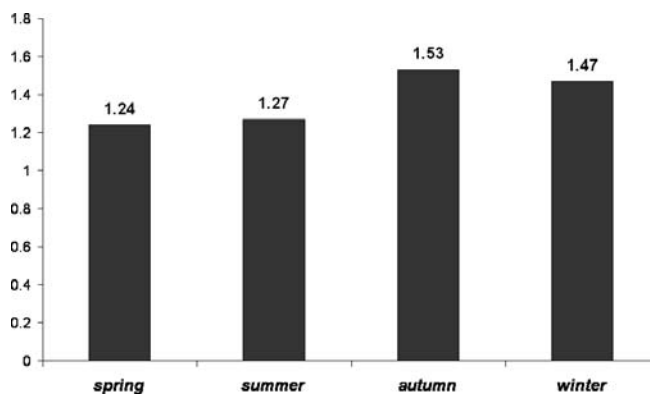
## MATERIALS AND METHODS

In this study, the blood samples collected from 400 head native cattle (in Western Azerbaijan province) in different seasons. Blood samples are taken from mature and non-pregnant female cattle. Samples were centrifuged in 2000G for separation of serum. Next, serums were transferred to tubes and numbered. Serum magnesium concentration was determined by colorimetric method. In this method, mg in alkaline environment made colloid particles  $Mg(OH)^2$ . This material with *Titan yellow* make red color complex that will fixed in polyvinyl alcohol. Next, sharpness and intensity of color were measured via 540 nm wave. Finally, data obtained from hematological analyzes are listed in Excel software.

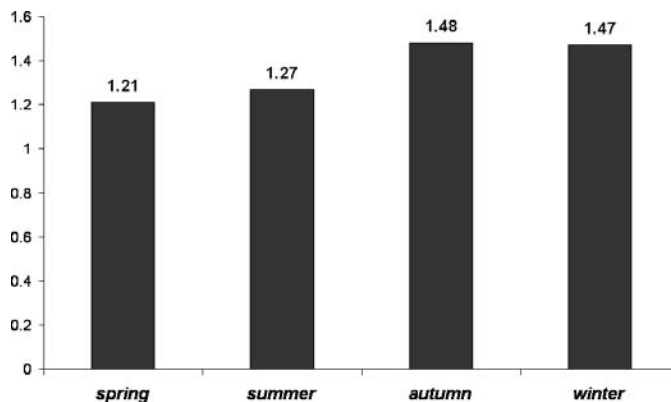
## RESULTS AND DISCUSSION

In this study, average of Mg concentration in serum of native cattle was 1.38 mg/dl. In total of seasonal evaluation, significant hypomagnesemia was not observed (figure1), but we recorded some cattle with lower mg level (lower than normal range); 0.85 mg/dl in spring and summer. These observations indicated incidence of sub-clinical hypomagnesemia in Azeri native cattle. In males, the low mg levels was recorded for spring by 1.10 mg/dl with average cattle age 26 months old (figure3), and in females (with normal physiological condition) the low mg levels was recorded for spring and summer by 1.21 and 1.27 mg/dl, respectively (figure 2).

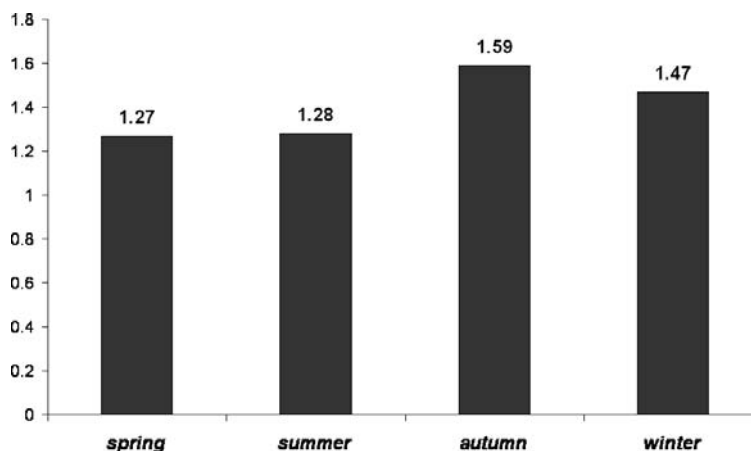
Also, the *Atomic Absorption Assays* were conducted for accuracy of obtained measures (Mg level).



**Figure 1.** Seasonal serum mg concentration of Iranian native cattle (mg/dl)



**Figure 2.** Seasonal serum mg concentration of Iranian native female cattle (mg/dl)



**Figure 3.** Seasonal serum mg concentration of Iranian native male cattle (mg/dl)

In Zafar et al (2009) study on native cattle of Punjab – Pakistan, it is reported that serum mg level of punjab native cattle had seasonal variation and high rate of mg concentration of milking cattle were observed at autumn. Shrikhande et al (2008) with study of 84 native dairy cattle in rainy, summer and winter seasons reported; serum mg concentration has minor decrease at rainy seasons and minor increase at winter, but mg differences between seasons in not significant, statistically. Also, Wildeus et al (1998) reported high concentration of serum and hepatic mg of senepol cattle is observed in dry seasons at Virginia State of America.

With review of these similar studies about native breeds, we can observe accordance between present study about mg level of Iranian native cattle and Wildeus et al (1998) and Zafar et al (2009). Before present study at western Azerbaijan province of Iran, Ramin et al (2005), conducted similar work on Holsteins cattle at western Azerbaijan province and observed that male Holstein calves had lower mg concentration at autumn and winter in compared with spring and autumn. This report about males (Ramin et al., 2005) is in according to our results about native cattle at same region. But their report about female Holstein dairy cattle (higher mg in spring and summer) is opposite to our observations for native cattle.

Its seem that, study of Ramin et al (2005) and present study make a suitable background for comparison of breed effect on seasonal mg concentration in same region (in this case, Azerbaijan region of Iran). The possible reason for differences between serum mg concentrations of cattle at Azerbaijan province of Iran may be in genetic related differences between Holstein and local native cattle that it observed in similar studies (Littledike et al., 1995), too.

Holstein dairy cattle have higher potential for milk production in compared with native cattle, especially at autumn and winter. Also, their nutrition is based on balanced rations according to NRC recommendation, because of this had sufficient available dietary minerals for support of mineral requirements during different seasons, but native cattle are grazed on pasture commonly without available sufficient dietary mg. in other hand, grasslands in spring and summer include low mg content grasses that may be cause incidence of hypomagnesemia in grazed cattle (native cattle), but Holsteins have ability to obtain sufficient mg from formulated concentrate feed, without need to pasture grass at these seasons.

Azeri native cattle are grazer in spring and summer and grasses are main part of their feeds. In other hand, frequently rainy weather in these seasons causes mg losing in soil and subsequent mg decreases in pasture plants, Because of high and linear correlation between pastures soil mg and serum mg of grazing cattle (Ram, 1998). Although peak point of milk yield of native cattle occurred at these seasons, because of this significant level of serum mg is excreted via milk. Also, this is possible reason for differences between mg levels in male and female cattle. But at autumn and

winter, because of native cattle feeding with alfalfa, concentrate feed and grain seeds (dietary mg sources), in these seasons hadn't incidence of hypomagnesemia in native cattle.

## CONCLUSION

It is concluded, serum mg of Iranian native cattle has seasonal variation; mg level of serum in spring and summer is low and in autumn and winter is in high rates. Genetic variation between breeds is involved with serum mg differences between pure and native breeds. In overall, the serum magnesium concentration of Iranian native cattle at western Azerbaijan province in different seasons is not significantly lower than reported optimum ranges. It seems that, the observed insignificant decline for Mg concentration in spring and summer hasn't risk for any diseases caused by hypomagnesaemia.

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