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RESEARCH ARTICLE

# Macro Mineral in Nelore Cows of Different Ages from the Bolivian Tropics

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## Abstract

The objective of the work was to evaluate if the multiparous adult cows presented any difference in the values of macro minerals compared to young primiparous Nelore cows from the Bolivian tropics. During the month of February 2021, a study was carried out with 14 multiparous adult cows and 13 young primiparous cows, belonging to the Technology Center on Agriculture and Livestock in Bolivia (FUNDACION CETABOL) Santa Cruz, Bolivia. The following variables were analyzed: Calcium, Phosphorus, Sodium, Potassium, Chlorine, and Magnesium. The cows used were: Adult cows of 4561 ± 95 days and Young cows of 1535 ± 99 days ($p \leq 0.001$). The values of the macro minerals analyzed and all of them have the values between the normal ranges and without showing significant differences between both groups.

Although the Phosphorus beyond having normal values, there are significant differences ($p \leq 0.05$) with the highest values in young cows. It is concluded that the multiparous adult cows did not present any difference in the values of macro minerals compared to young primiparous Nelore cows from the Bolivian tropics.

**Keywords:** Nelore cows, Calcium, Phosphorus, Magnesium, Grazing system

## Introduction

An important factor for the profitability of beef cattle systems is the period in which cows remain productive, since their permanence and productivity affect production costs.

There are differences in the longevity of cows between different production systems, this may be associated with environmental factors, herd size, feeding and management [1].

Minerals are essential elements to maintain the vital functions of animals, and that is why mineral requirements are as important as other nutrients [2].

The absence of minerals in the diet can imply deficiencies and, consequently, damage animal productive performance [3].

The lower tropic of Bolivia is characterized by having very marked climatic seasons, a rainy season (six months from November to April), and a dry season, at this time not only the animals suffer from mineral deficiencies, but the food is found in less amount in the grassland cover [4] .

The low productivity of the herds in cattle ranches may have its origin in a deficiency of micronutrients, since the cattle in these areas depend exclusively on the forages found in the pastures to provide themselves with minerals, whose soils are poor in these elements [5].

A Nelore cattle is one of the most widely used breeds in various regions of the world, but it needs research, mainly in relation to mineral nutrition [3]. In the same way, no studies are observed regarding the situation of macro-mineral values in adult beef cows. These studies would make it possible to have a better knowledge of the internal environment, allowing having information that would facilitate its management and the assessment of the need to have long-lived cows in the herd. The search for elements necessary to sustain the benefits of the longevity of the cows would help to consolidate the search in the productive systems of the longest-lived cows.

The objective of the work was to evaluate if the multiparous adult cows presented any difference in the values of macro minerals compared to young primiparous Nelore cows from the Bolivian tropics.

## Materials and Methods

During the month of February 2021, a study was carried out with 27 primiparous and multiparous Nelore cows from a

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herd of 135 total cows belonging to the Technology Center on Agriculture and Livestock in Bolivia (FUNDACION CETABOL) in Colonia Okinawa. (17 ° 13 ′ 12 ″ south latitude, 62 ° 53 ′ 39 ″ west longitude) Santa Cruz, Bolivia. The community is located at 286 m.s.n.m. and it has a tropical climate, with significant rainfall in most months of the year and a short dry season with little effect on the general climate. The average annual temperature is 24.3 ° C with average rainfall of 986 mm in Colonia Okinawa. Rainfall is minimal in July, with average values of 50 mm, the wettest month in January with an average rainfall of 330 mm. The highest average temperatures correspond to the month of January, with values of 26.5 ° C and the lowest to the month of July with records of 20.7 ° C.

### Animals

Fourteen multiparous adult cows (Adult Group: AG) between ten and fifteen years old and thirteen young primiparous cows (Young Group: YG) between three and four years old were used. The cows of both groups were with calves at the foot and gestating at the time of taking the sample

### Feeding and Management

The herd was fed grazing managed in intensive conditions, with cultivated pastures Brachiaria decumbens (8 to 12 t / ha / year of DM), Brachiaria humidicola (8 to 10 t / ha / year of DM), Brachiaria dictyoneura (8 to 10 t / ha / year of DM), Cynodon dactylon (10 to 20 t / ha / year of DM) and Panicum maximum cv mombaza (20 to 28 t / ha / year of DM) [6]

### Variables to analyze

Age at the time of sample collection: date of sample collection - date of birth in days Macrominerals Calcium (mg / dL), Phosphate (mg / dL), Sodium (mmol / L), Potassium (mmol / L), Chlorine (mmol / L), Magnesium (mg / dl)

### Sampling

A total of 5 ml of blood was collected from the coccygeal vein and was distributed in a Lithium heparin blood collection tube. Once the whole-blood sample is collected, testing was conducted within 2 hours (at room temperature) in order to prevent cellulose precipitation in the blood. The analysis is done in the Artemis Veterinarian laboratory in the city of Santa Cruz - Bolivia, for the determination of the content of Calcium (mg / dL), Phosphorus (mg / dL), Sodium (mmol / L), Potassium ( mmol / L), Chlorine (mmol / L), Magnesium (mg / dl) through laboratory equipment SKYLA VB1 Chemistry Analyzer produced by Lite-ON Technology Corp. HSPB

### Statistical Analysis

The means and standard errors were obtained and it was tested whether there were significant differences between the groups (AG and YG) by applying analysis of variance to a classification criterion. Means for one-way ANOVA. Statistical analyzes were performed with the JMP software package in its version 5.0 for Windows (JMP®, SAS Institute, 2003).

## Results

The mean values and standard errors of the days of life of the cows used, according to the group they belonged to at the time of blood sampling and measurement were: AG of 4561 ± 95 days and YG of 1535 ± 99 days showing differences significant ($p \leq 0.001$).

Indicating that there are two different groups for comparison and the median and ranges of the number of deliveries of both groups were: AG 9 (6-12) and YG 1 (1).

Table 1 shows the values of the macro minerals analyzed and all of them have values between normal ranges and without showing significant differences between both groups. Although, the Phosphorus beyond having normal values, there are significant differences ($p \leq 0.05$) with the highest values in young cows.

## Discussion

In this work, Calcium values were found within the normal ranges (8.4 - 11 mg / dL) [2, 7, 8] and without showing significant differences between both groups of adult and young cows. Rosas and Moreno [5] reported an average of calcium in the blood serum of the cows analyzed of 10.6 mg / dL in the Bolivian tropics.

With regard to Phosphorus, values were obtained within normal ranges (4.3-7.8 mg / dL) [2, 7, 8] and with showing significant differences ($p \leq 0.05$) having the highest values the young cows.

Rosas and Moreno [5] found average calcium in the blood serum of the cows analyzed of 5.24 mg / dL in the Bolivian tropics. Sánchez [9] found values of 5.28 mg / dL of phosphorus in the region.

**Table 1:** Macro mineral values by group.

| Groups | Ca (mg/dL) | P (mg/dL) | Na (mmol/L) | K (mmol/L) | Cl (mmol/L) | Mg (mg/dL) |
|---|---|---|---|---|---|---|
| AG | 8.9 ± 0.1 | 5.2 ± 0.1 | 145.5 ± 3 | 5.5 ± 0.5 | 100 ± 1.6 | 2.0 ± 0.1 |
| YG | 9.2 ± 0.1 | 5.7 ± 0.1 | 146.1 ± 2 | 5.3 ± 0.4 | 100 ± 2.2 | 1.9 ± 0.1 |
| Signif. | ns | * | ns | ns | ns | ns |

All values correspond to the arithmetic mean ± standard error.
Sample size: AG: 14 cows and YG: 13.
ns (not significant); * ($p \leq 0.05$); ** ($p \leq 0.001$); *** ($p \leq 0.0001$)
Ca: Calcium; P: phosphorus; Na: Sodium; K: Potassium; Cl: Chlorine; Mg: Magnesium

The magnesium values found were within the normal ranges (1.7-3.0 mg / dL) [2,7,8] and without showing significant differences between both groups of adult and young cows.

Rosas and Moreno [5] found average calcium in the blood serum of the cows analyzed of 2.82 mg / dL in the Bolivian tropics. Hoyos [10] and Prestel [11] reported Mg values lower than 2.0 mg / dL and Sánchez [9] 2.7 mg / dL in the same area.

The values of Sodium (134.5-148.1 mg / dL), Potassium (4.0-5.8 mg / dL) and Chlorine (95.7-108.6 mg / dL) were within the normal ranges and without showing significant differences between both groups of adult and young cows. The adult cows remained within the normal ranges in the values of macro minerals.

It is no reason, at least for this work, to rule out adult cows from the herd. If these works were repeated, it would help to have more elements so as not to discard adult cows or try to have a greater number of them in the herd.

Having a greater number of adult cows in the herd close to 80%, would make it possible from a zoo technical concept that the traits associated with biological efficiency such as longevity and reproduction of the animals contribute to greater sustainability to the productive system [12].

## Conclusion

It is concluded that the multiparous adult cows did not present any difference it in the values of macro minerals compared to young primiparous Nelore cows from the Bolivian tropics.

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